

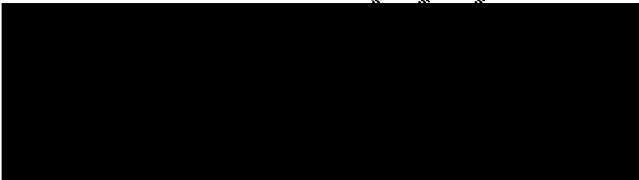
Report VA3807.210929.NIA

Shripney Care Home, Bognor Regis

Noise Impact Assessment

30 September 2021

**LNT Construction
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Attachments

VA3807/SP1	Indicative Site Plan
VA3807/TH1-TH4	Environmental Noise Time Histories
Appendix A	Acoustic Terminology

1. Introduction

It is proposed to develop the site on Shripney Road, Bognor Regis for use as a care home.

Venta Acoustics has been commissioned by LNT Construction to undertake an assessment of the current environmental noise impact on the site and provide recommendations of acoustic mitigation where required in support of an application for planning permission.

An environmental noise survey has been undertaken to determine the noise levels incident on the site. These levels are then used to undertake an assessment of the likely impact in accordance with the National Planning Policy Framework with reference to relevant standards, guidance and the planning requirements of Arun District Council.

Outline mitigation measures are considered and an appraisal of the requirements of external building fabric elements are provided where appropriate.

2. Guidance and Legislation

2.1 The National Planning Policy Framework (2021)

The revised *National Planning Policy Framework* (NPPF), published in July 2021, sets out the Government's planning policies for England, superseding all previous planning policy statements and guidance.

In respect of noise, the NPPF states that the planning system should contribute to and enhance the natural and local environment by preventing both new and existing developments from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of noise pollution.

Hence, Paragraph 185 states that *planning policies and decisions should also ensure 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:*

- a) 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*
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason*

In regards to the term adverse impact, reference is made to the Noise Policy for England:

2.2 Noise Policy Statement for England (2010)

The Noise Policy Statement for England (NPSE) sets out the long term vision of Government noise policy: to promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

This vision is supported by the following aims:

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

The terms “significant adverse” and “adverse” are related to the following concepts:

- No Observed Effect Level (NOEL) - the level below which no effect on health and quality of life can be detected.
- Lowest Observed Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected.
- Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.

The guidance acknowledges that it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations, but will be different for different noise sources, receptors and times.

In order to enable assessment of impacts in line with these requirements, reference should be made to other currently available guidance.

2.3 WHO Guidelines for Community Noise (1999)

The guidance in this document details suitable noise levels for various activities within residential and commercial buildings.

The relevant sections of this document are shown in Table 2.1.

Criterion	Environment	Design range $L_{Aeq,T}$ dB
Maintain speech intelligibility and avoid moderate annoyance, daytime and evening	Living Room	35 dB
Prevent sleep disturbance, night time	Bedrooms	30 dB

Table 2.1 – Excerpt from WHO

[dB ref. 20µPa]

This guidance also states:

For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10-15 times a night (Vallet & Vernet 1991).

For outdoor living areas, it is stated that:

To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55dB LAeq on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50dB LAeq. Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development.

For sleep disturbance, i.e. in bedrooms at night, the NOEL can, therefore, be taken as anything below 30dB(A), whilst the onset of the LOAEL occurs at 30dB(A) and above. The SOAEL cannot be inferred from this information.

During daytime periods, for avoidance of annoyance, the NOEL relates to anything up to 50dB(A) (typically applied to external areas, such as gardens), whilst the onset of the LOAEL occurs at 50dB(A) and above.

2.4 BS8233:2014

BS8233 *Guidance on sound insulation and noise reduction for buildings* provides guidance as to desirable internal ambient noise levels for different areas within residential buildings.

The relevant section of the standard is shown below in Table 2.2.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB LAeq, 16 hour	-
Dining	Dining Room	40 dB LAeq, 16 hour	-
Sleeping (daytime resting)	Bedroom	35 dB LAeq, 16 hour	30 dB LAeq, 8 hour

Table 2.2 – Excerpt from BS8233:2014 - Indoor ambient noise levels for dwellings

[dB ref. 20μPa]

For external areas the standard states the following:

For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB LAeq,T, with an upper guideline value of 55 dB LAeq,T which would be acceptable in noisier environments.

However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

3. Site Description

As illustrated on attached site plan VA3807/SP1, the site is currently occupied by a detached residential property on a large plot to the east of Shripney Road. The area is primarily residential with a hotel to the north, agricultural fields to the east and residential uses to the south and west.

The dominant noise sources expected to affect the site are traffic on Shripney Road.

4. Environmental Noise Survey

4.1 Survey Procedure & Equipment

In order to establish the existing noise levels at the site, a noise survey was carried out between Friday 10th and Tuesday 14th September 2021 at the location shown in site plan VA3807/SP1. This location was chosen to be representative of the noise levels incident on the most affected noise sensitive receivers.

Continuous 5-minute samples of the L_{Aeq} , L_{Amax} , L_{A10} and L_{A90} sound pressure levels were undertaken at the measurement location.

The weather during the survey period was generally dry with light winds. The background noise data is not considered to have been compromised by these conditions.

Measurements were made generally in accordance with ISO 1996 2:2017 *Acoustics - Description, measurement and assessment of environmental noise – Part 2: Determination of sound pressure levels*.

The following equipment was used in the course of the survey:

Manufacturer	Model Type	Serial No	Calibration	
			Certificate No.	Date
NTi Class 1 Integrating SLM	XL2	A2A-11461-E0	UCRT20/1699	27/7/20
Larson Davis calibrator	CAL200	13069	UCRT20/1562	26/6/20

Table 4.1 – Equipment used for the survey

The calibration of the sound level meter was verified before and after use with no significant calibration drift observed.

4.2 Results

The measured sound levels are shown as time-history plots on the attached charts VA3807/TH1-4.

The site is primarily affected by road traffic.

The average noise levels for the Daytime and Night-time periods, as measured at the automated monitoring position were:

Monitoring Period	$L_{Aeq,T}$
07:00 – 23:00 hours	53 dB
23:00 – 07:00 hours	46 dB

Table 4.2 – Average ambient noise levels at measurement locations

[dB ref. 20µPa]

The typical night time L_{Amax} events, generated by vehicle passbys on Shripney Road, were recorded to be in the order of 60dB $L_{Amax,fast}$.

5. Discussion

The above measured noise levels, determined by traffic on the road, are valid on the most exposed façade (west) of the proposed building. The other facades will be screened from the traffic and so lower noise levels are expected on the other facades.

BS8233 suggests that a loss of around 15dB can be expected from a partially open window. The document also includes a note that states ‘...the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved’. It is considered that where occupants have a choice, the desirable aspect of an open window offsets the slight increase in internal noise levels and the 5dB relaxation to achieve ‘reasonable’ internal levels is generally acceptable.

The following table summarises the implications of external levels on the requirement for windows to be able to remain open.

Period	External Noise Level			
	$<L_{Aeq} 45dB$	$L_{Aeq} 45dB - 50dB$	$L_{Aeq} 50dB - 55dB$	$\geq L_{Aeq} 55$
Internal Levels Daytime (07:00-23:00 hours)	$L_{Aeq,16hr} < 35dB$ ‘Desirable’ Internal noise level with open windows		$L_{Aeq,16hr} < 40dB$ ‘Reasonable’ Internal noise level with open windows	$\geq L_{Aeq,16hr} 40dB$ Windows should be closed to control internal levels
Internal Levels Night Time (23:00-07:00 hours)	$L_{Aeq,8hr} < 30dB$ ‘Desirable’ Internal noise level with open windows	$L_{Aeq,8hr} < 35dB$ ‘Reasonable’ Internal noise level with open windows	$L_{Aeq,8hr} \geq 35dB$ Windows should be closed to control internal levels	

Table 5.1 – Summary of implication of external noise levels on the requirements for windows to able to remain open (applicable to bedrooms).

The above relates to continuous traffic noise only. L_{Amax} levels from individual events must also be considered.

On this basis, it is considered that reasonable levels can be achieved in all rooms with windows partially open. In the majority of rooms, the desirable internal noise levels are expected to be achieved with windows open.

Similarly, applying a 15dB reduction to the night time L_{Amax} levels would result in internal levels of $L_{Amax} 45dB$ up to 15 times per night on the most affected facade. This is in line with the recommended limits in WHO.

5.2 Internal Noise Assessment

A review of the LNT Construction drawings for the proposed scheme has been undertaken.

The private bedrooms are along the length of the building on each façade, with communal dining and living space in the central part of the building.

5.2.1 Sound Reduction Performances of Building Elements

It has been assumed that all the non-glazed elements, i.e. walls and roof systems, will be capable of providing the following minimum sound insulation performance, when tested in accordance with BS EN ISO 10140-2:2010 *Acoustics - Laboratory measurement of sound insulation of building elements – Part 2: Measurement of airborne sound insulation*.

Building Element	Single figure weighted sound reduction index, dB
Roof	R_w 45
Masonry	R_w 51

Table 5.2 – Assumed sound reductions performances of non-glazed elements

5.2.2 Sound Reduction Performance of Windowsets and Vents

Examples in BS8233 suggest a sound insulation performance of R_w 27dB for standard double glazed windows. A standard trickle vent is expected to provide a performance of $D_{n,e,w}$ 35dB.

These are summarised in Table 5.3 below.

Glazing Reference	Required Glazing SRI, dB	Ventilator Performance, dB
All Glazing	R_w 27	$D_{n,e,w}$ 35

Table 5.3 – Assumed performance for glazing and ventilators

With this glazing in place, internal noise levels are expected to be below L_{Aeq} 30dB with L_{Amax} events typically being below 36dB.

5.2.3 Windowset Performances

It is important that the performance shown in Table 5.3 are achieved by the entire windowset including frames, ventilators, seals, etc. Glass performance alone would not be likely to show compliance with the specification as the other elements typically provide the weakest noise transmission path.

The ventilator performances provided would need to be achieved with the vents open. Should this performance not be achievable, a mechanical ventilation solution may be required.

5.2.4 Ventilation

As discussed, although internal ambient noise levels and maximum levels would marginally exceed the recommended internal noise levels, 'reasonable' noise levels are considered to be obtainable with windows open and are expected to be acceptable.

To allow the desirable internal noise levels to be maintained, the design must allow for windows to remain closed.

In order that windows may remain closed, it is expected that attenuated means of background ventilation will be required. If trickle vents are used the performance shown in Table 5.3 will be required. The figures stated are for a single vent per room. If multiple vents are required, then the performance requirement shown in Table 5.3 will increase by a value equal to $+10\log(N)$, with N being the total number of vents serving the room.

It should be noted that there is no reason why windows could not be opened as a matter of personal preference or for purge ventilation.

5.3 Resultant Internal Noise Levels

With the above windows and systems in place, internal noise levels within the proposed rooms would be expected to comfortably meet the recommendations given in the WHO 1999 and BS8233:2014 guidance.

Monitoring Period	Expected internal Noise Level		BS8233 Requirement
	Windows Open (5dB relaxation suggested)	Windows Closed	
$L_{Aeq,16hr}$ 07:00 – 23:00 hours	38 dB	22 dB	35 dB
$L_{Aeq,16hr}$ 23:00 – 07:00 hours	31 dB	15 dB	30 dB
L_{Amax} 23:00 – 07:00 hours	45 dB	29 dB	45 dB

Table 5.4 – Internal Noise levels calculated for most affected facade

5.4 Areas of External Amenity

External noise levels in the proposed gardens at the rear of the building comply with the World Health Organisation guideline value for external amenity of $L_{Aeq,16hour}$ 55dB. No mitigation measures are deemed necessary in relation to external noise levels.

6. Carpark Noise

The noise from the hotel carpark immediately to the north of the site is considered.

Noise from low speed vehicle movements in the carpark is not expected to be significant. Measurements of passenger cars moving at low speed on gravel roads, undertaken on previous projects, indicate a typical level of L_{Aeq} 65dB at 1m. At a distance of 10m this is reduced to approximately 45dB. Allowing a loss of 15dB through a partially open window, this would result in

noise levels not exceeding L_{Aeq} 30dB for these short duration events. This meets the criteria for bedrooms at night.

A calculation of noise levels expected from car door slams in the carpark is shown below:

Maximum Levels – Car Door Slams	
Car door slam @1m	82
Distance loss, 10m	-20
Level outside window	62dB
Loss for partially open window (BS8233)	-15
Internal Noise Level	47

Table 6.1 – Assessments of maximum noise levels

With bedroom windows open, maximum noise levels from hard car door slams in the parking bays nearest the care home are expected to marginally exceed the WHO recommended maximum noise levels of L_{Amax} 45dB at night (10-15times per night). This is not expected to be a regular occurrence as there are limited spaces along the boundary and the larger carpark is behind the hotel building. Most people would check into the hotel during the day and so the noise would mostly occur during the day or in the evening rather than the night-time.

7. Conclusion

A baseline noise survey has been undertaken by Venta Acoustics to establish the prevailing noise climate in the locality of the residential dwelling named as 'The Cottage', Bognor Regis in support of a planning application for the proposed development of a new residential care home.

The measured levels have been assessed against the National Planning Policy Framework and currently available standards and guidance documents including World Health Organisation *Guidelines for Community Noise* (1999) and BS8233:2014 *Guidance on sound Insulation and noise*.

Noise levels at the proposed new building are modest. It is found that with windows open on the most affected façade, the BS8233 recommended noise levels would be marginally exceeded. However, this is typically considered acceptable as a result of the desirable aspect of opening the windows. With windows closed the recommended noise levels are comfortably achieved.

Noise from the hotel carpark is also considered and expected to have a low impact.

The proposed scheme is not expected to experience a significant adverse noise impact and the site is considered acceptable for the proposed use.

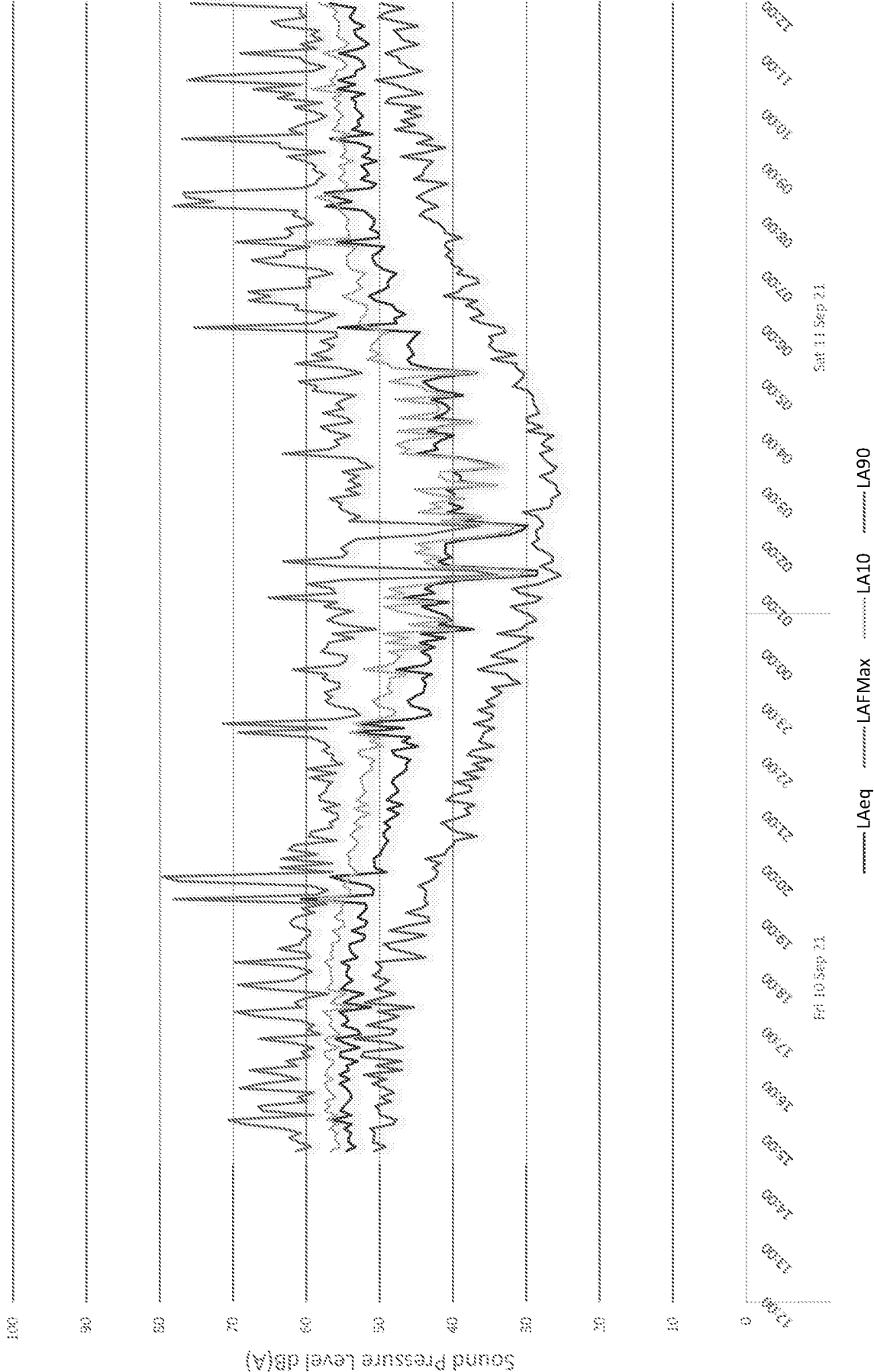
Steven Liddell MIOA



Shripney Care Home, Bognor Regis
Environmental Noise Time History: 1



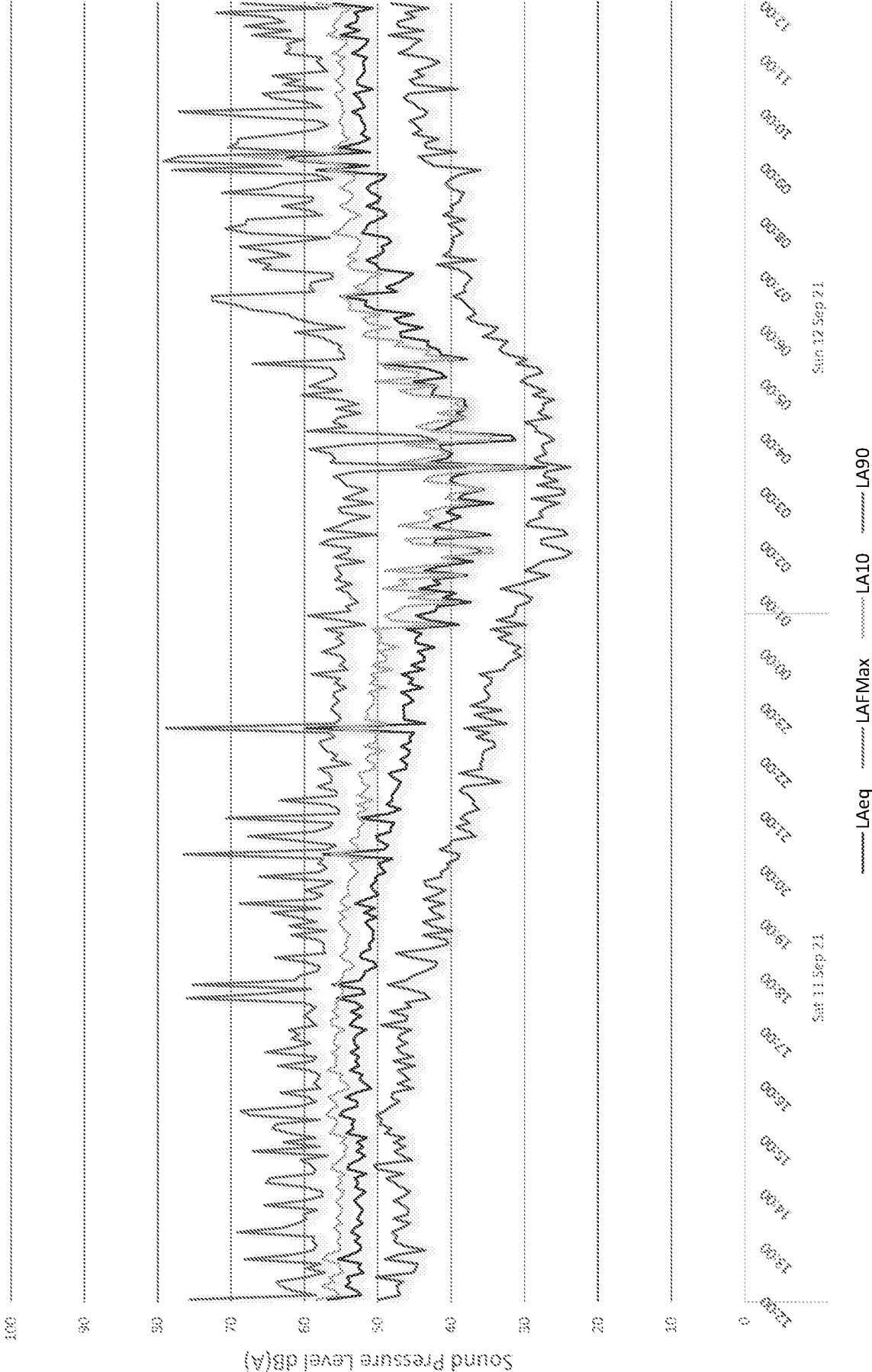
Figure VA3807/TH1



Shripney Care Home, Bognor Regis
Environmental Noise Time History: 2



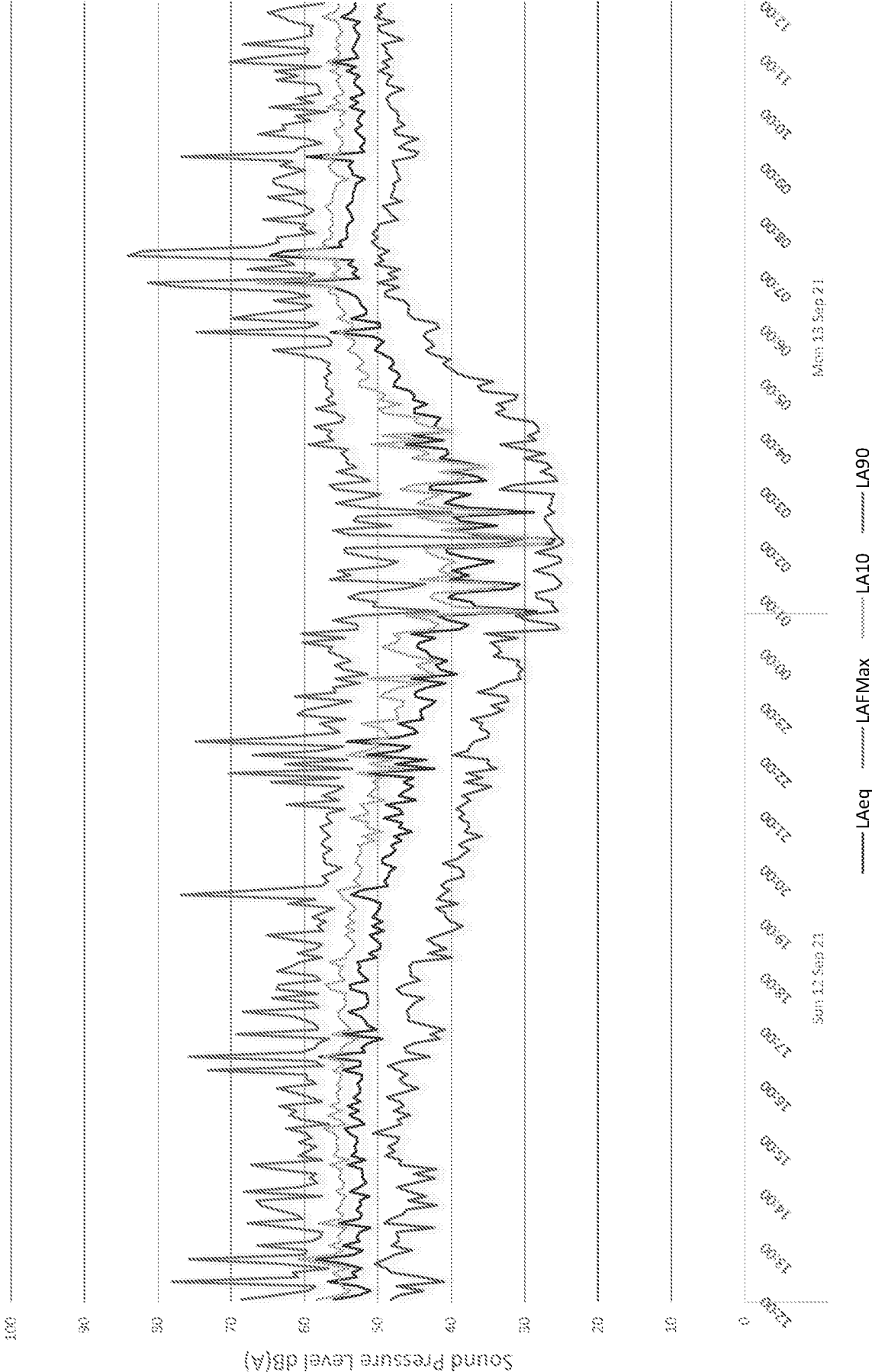
Figure VA3807/TH2



Shripney Care Home, Bognor Regis
Environmental Noise Time History: 3



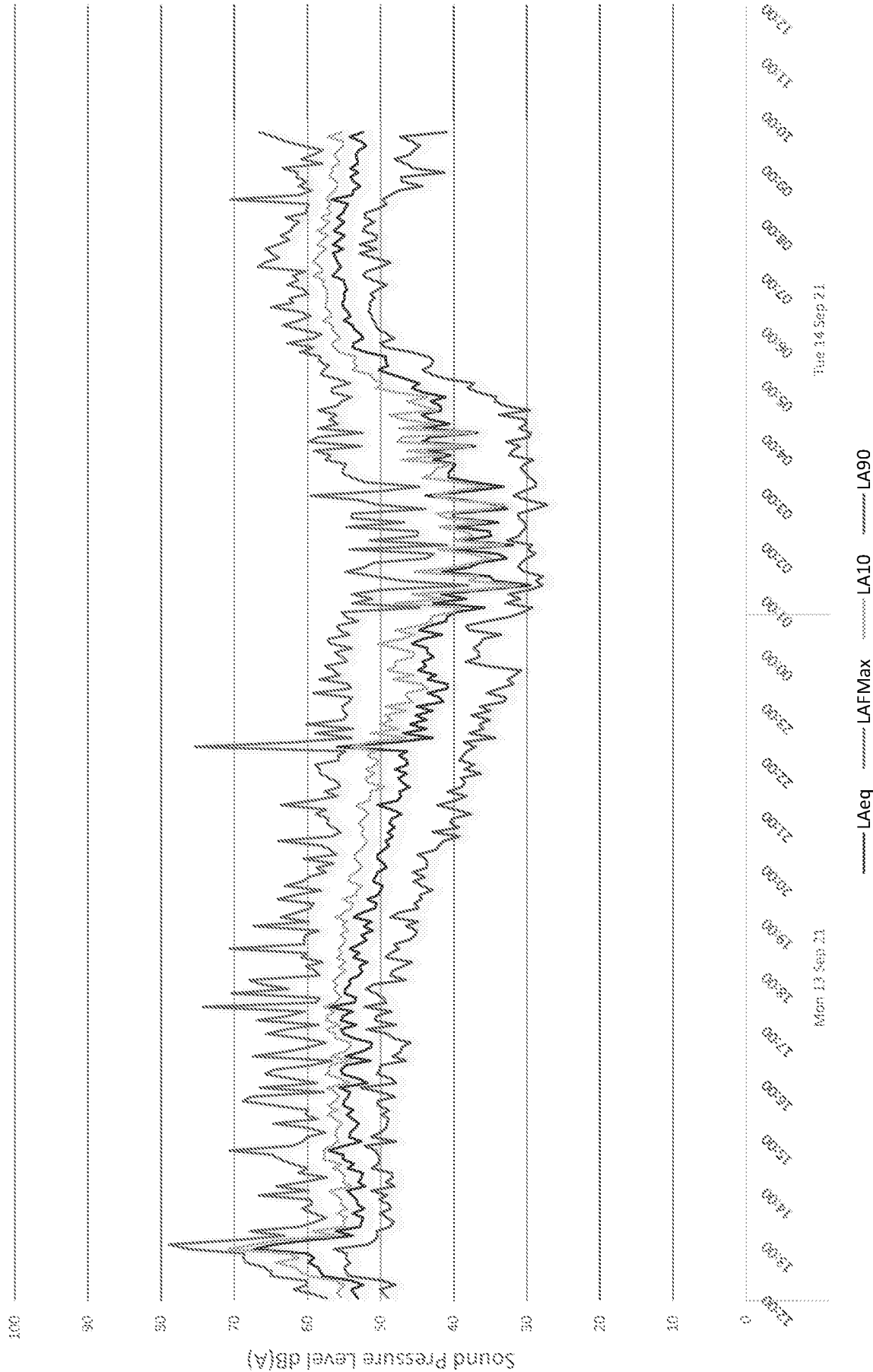
Figure VA3807/TH3



Shripney Care Home, Bognor Regis
Environmental Noise Time History: 4



Figure VA3807/TH4



APPENDIX A

Acoustic Terminology & Human Response to Broadband Sound

1.1 Acoustic Terminology

The human impact of sounds is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and variation in level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

Sound	Vibrations propagating through a medium (air, water, etc.) that are detectable by the auditory system.
Noise	Sound that is unwanted by or disturbing to the perceiver.
Frequency	The rate per second of vibration constituting a wave, measured in Hertz (Hz), where 1Hz = 1 vibration cycle per second. The human hearing can generally detect sound having frequencies in the range 20Hz to 20kHz. Frequency corresponds to the perception of 'pitch', with low frequencies producing low 'notes' and higher frequencies producing high 'notes'.
dB(A):	Human hearing is more susceptible to mid-frequency sounds than those at high and low frequencies. To take account of this in measurements and predictions, the 'A' weighting scale is used so that the level of sound corresponds roughly to the level as it is typically discerned by humans. The measured or calculated 'A' weighted sound level is designated as dB(A) or L_A . A notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc).
L_{eq} :	The concept of L_{eq} (equivalent continuous sound level) has primarily been used in assessing noise from industry, although its use is becoming more widespread in defining many other types of sounds, such as from amplified music and environmental sources such as aircraft and construction. Because L_{eq} is effectively a summation of a number of events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute sound limit.
L_{10} & L_{90} :	Statistical L_n indices are used to describe the level and the degree of fluctuation of non-steady sound. The term refers to the level exceeded for n% of the time. Hence, L_{10} is the level exceeded for 10% of the time and as such can be regarded as a typical maximum level. Similarly, L_{90} is the typical minimum level and is often used to describe background noise. It is common practice to use the L_{10} index to describe noise from traffic as, being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic flow.
L_{max} :	The maximum sound pressure level recorded over a given period. L_{max} is sometimes used in assessing environmental noise, where occasional loud events occur which might not be adequately represented by a time-averaged L_{eq} value.

1.2 Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation has agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band. In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, e.g. 250 Hz octave band extends from 176 Hz to 353 Hz. The most commonly used octave bands are:

Octave Band Centre Frequency Hz		63		125		250		500		1000		2000		4000		8000
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1.3 Human Perception of Broadband Noise

Because of the logarithmic nature of the decibel scale, it should be borne in mind that sound levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) sound level is not twice as loud as 50dB(A). It has been found experimentally that changes in the average level of fluctuating sound, such as from traffic, need to be of the order of 3dB before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10dB is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in environmental sound level can be given.

Change in Sound Level dB	Subjective Impression	Human Response
0 to 2	Imperceptible change in loudness	Marginal
3 to 5	Perceptible change in loudness	Noticeable
6 to 10	Up to a doubling or halving of loudness	Significant
11 to 15	More than a doubling or halving of loudness	Substantial
16 to 20	Up to a quadrupling or quartering of loudness	Substantial
21 or more	More than a quadrupling or quartering of loudness	Very Substantial

1.4 Earth Bunds and Barriers - Effective Screen Height

When considering the reduction in sound level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a tall barrier exists between a sound source and a listener, with the barrier close to the listener, the listener will perceive the sound as being louder if he climbs up a ladder (and is closer to the top of the barrier) than if he were standing at ground level. Equally if he sat on the ground the sound would seem quieter than if he were standing. This is explained by the fact that the "effective screen height" is changing with the three cases above. In general, the greater the effective screen height, the greater the perceived reduction in sound level.

Similarly, the attenuation provided by a barrier will be greater where it is aligned close to either the source or the listener than where the barrier is midway between the two.