

Report VA3730.210818.NIA1.1

148 Parrock Street, Gravesend

Noise Impact Assessment

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Attachments

VA3730/SP1	Indicative Site Plan
VA3730/TH1-TH3	Environmental Noise Time Histories
Appendix A	Acoustic Terminology
Appendix B	Acoustic Calculations

1. Introduction

It is proposed to install a new kitchen extract system to service the premises at 148 Parrock Street, Gravesend.

Venta Acoustics has been commissioned by Planning Direct to undertake an assessment of the potential noise impact of these proposals in support of an application for planning permission.

An environmental noise survey has been undertaken to determine the background noise levels at the most affected noise sensitive receptors. These levels are used to undertake an assessment of the likely impact with reference to the planning requirements of Gravesham Borough Council.

2. Design Criterion and Assessment Methodology

2.1 Gravesham Borough Council Requirements

The delegated report for the application ref 20210175 provides the following comments regarding noise.

Prior to determination of this application the applicant is required to provide the following to the LPA for approval:

a. Details of the ventilation extraction system, particularly regarding odour elimination abilities, residence time of the air within the filters and likely noise emissions shall be submitted to and approved, in writing by the Local Planning Authority. The approved scheme shall be installed prior to operation in accordance with the approved details.

b. A sound insulation assessment shall be carried out and submitted to and approved in writing by the Local Planning Authority. The Assessment shall include details of the substantially enhanced sound insulation performance of the construction that separates the residential and commercial unit, which shall aim to resist the transmission of airborne sound such that the weighted standardised difference ($D_{nT,W} + C_{tr}$) is not be less than 53 decibels (i.e. an enhancement of the minimum levels stated in the Building Regulations of 10dB). The scheme shall then be installed prior to occupation in accordance with the approved details.

c. A noise impact assessment shall be carried out detailing the impact on the existing and proposed residences arising from the proposed ground floor use (including from customer noise, plant and machinery, odour extraction system, early morning deliveries, etc.) A suitable scheme that takes into account the above assessments of the site shall be submitted to and approved in writing by the Local Planning Authority. Reference shall be made to British Standard 8233:2014 and BS4142:2014. The approved scheme shall be implemented prior to occupation and operation.

Gravesham Borough Council's requirements for noise emissions from plant is understood to be at least 10dB below the local background noise level as assessed at the most affected noise sensitive receivers.

2.2 BS4142:2014

British Standard BS4142:2014 *Methods for rating and assessing industrial and commercial sound* describes a method for rating and assessing sound of an industrial and/or commercial nature, which includes sound from fixed installations comprising mechanical and/or electrical plant and equipment;

The assessment methodology considers the Specific Sound Level, as measured or calculated at a potential noise sensitive receptor, due to the source under investigation. A correction factor is added to this level to account for the acoustic character of the sound as follows:

Tonality – A correction of up to 6dB depending on the prominence of tones;

Impulsivity - A correction of up to 9dB depending on the prominence of impulsivity;

Other sound characteristics - A 3dB correction may be applied where a distinctive acoustic character is present that is neither tonal nor impulsive;

Intermittency - A 3dB correction may be applied where the specific sound has identifiable on/off conditions.

An estimate of the impact of the source is obtained by subtracting the typical background noise level from the corrected Specific Sound Level.

- Typically, the greater this difference, the greater the magnitude of the impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB could be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background sound level, the less likely it is that there will be an adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound having a low impact, depending on the context.

2.3 BS8233:2014

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

The relevant section of the standard is shown below in Table 2.1.

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

Table 2.1 - Excerpt from BS8233: 2014

[dB ref. 20µPa]

3. Site Description

As illustrated on attached site plan VA3730/SP1, the site building is located in a terrace of properties with retail premises at ground floor level, with apartments above. The nearby shops include a number of other takeaway premises.

The most affected noise sensitive receiver is expected to be apartment above.

Existing building services plant was noted on several of the neighbouring buildings.

4. Environmental Noise Survey

4.1 Survey Procedure & Equipment

In order to establish the existing background noise levels at the site, a noise survey was carried out between Monday 28th and Wednesday 30th June 2021 at the location shown in site plan VA3730/SP1. This location was chosen to be representative of the background noise level at 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	13049	UCRT21/1385	22/3/21

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 VA3730/TH1-3.

The background noise level is determined by road traffic in the area, as well as building services from one of the nearby properties.

The typical background noise levels measured were:

Monitoring Period	Typical ¹ L _{A90,5min}
07:00 – 23:00	38 dB
23:00 – 07:00	33 dB
Operational hours, 08:00 – 22:00	39 dB
Desired operational hours, 07:00 – 22:00	39 dB

Table 4.2 – Typical background noise levels [dB ref. 20 µPa]

¹ The typical L_{A90} value is taken as the 10th percentile of all L_{A90} values measured during the relevant period.

4.3 Plant Noise Emission Limits

On the basis of the measured noise levels and the planning requirements of the Local Authority, and considering that it is not expected that tonal noise will be generated by the proposed plant units, the following plant specific sound levels should not be exceeded at the most affected noise sensitive receivers:

Monitoring Period	Design Criterion (L _{Aeq})
07:00 – 23:00 hours	28 dB
23:00 – 07:00 hours	23 dB
Operational hours, 08:00 – 22:00	29 dB

Table 4.3 – Specific sound pressure levels not to be exceeded at most affected noise sensitive receivers

5. Predicted Noise Impact

5.1 Proposed plant

The following plant is proposed for installation externally with a duct running up the rear of the building and terminating above eaves level, at the location indicated on site plan VA3730/SP1.

Plant Item	Quantity	Proposed Model	Notes
Extract Fan	1	Polestar 355	Only operational during opening hours

Table 5.1 – Indicative plant selections assumed for this assessment.

Consulting the manufacturer's datasheets, the manufacturer has only provided a dB(A) noise level for the units. The assumed spectral noise levels used in the calculation have been based on a similar sized unit, corresponding to the dB(A) level quoted by the manufacturer.

Plant Item	Octave Band Centre Frequency (Hz) Sound Power, L_w (dB)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Polestar 355	69	71	78	72	71	70	69	67	78

Table 5.2 – Advised plant noise data used for the assessment.

5.2 Recommended Mitigation Measures

The atmospheric side of the extract ductwork will need to be fitted with attenuation providing the following minimum insertion loss.

Attenuation Component	Octave Band Centre Frequency (Hz) Attenuation Insertion Loss (dB)							
	63	125	250	500	1k	2k	4k	8k
Extract attenuation	5	13	20	33	52	41	39	30

Table 5.3 – Atmospheric side extract attenuation requirement

Should the above insertion loss be achieved using multiple silencers, these should be separated from each other by a distance of minimum $3-4 \times D$, where D is the largest internal dimension of the duct work (e.g. D is 0.5m, so a minimum of 1.5-2m apart). Attenuators should be fitted as close to the fan as possible, and attached to the ductwork using flexible connections.

For the extract attenuator, it is recommended that a Melinex lined silencer is used to prevent grease impregnation into the acoustic media which may degrade the performance realised over time.

The fan motor will also need to be enclosed within an additional casing providing the minimum sound reduction insertion loss shown in Table 5.4.

Attenuation Component	Octave Band Centre Frequency (Hz) Extract Fan Casing Insertion Loss (dB)							
	63	125	250	500	1k	2k	4k	8k
Fan Casing	3	6	10	13	17	22	33	38

Table 5.4 – Extract fan casing requirement

Please note that the above recommendations relate to acoustic issues only. It is recommended that professional advice confirming the suitability of these measures be sought from others with regards to issues such as airflow, structural stability and visual impact.

5.3 Predicted noise levels

The cumulative noise level at the most affected noise sensitive receiver at first floor level has been calculated on the basis of the above information and assuming the recommended mitigation measures, with reference to the guidelines set out in BS4142:2014.

A summary of the calculations are shown in Appendix B.

Predicted Cumulative Noise Level	Design Criterion
L _{Aeq} 29 dB	L _{Aeq} 29 dB

Table 5.5 – Predicted cumulative noise level at most affected noise sensitive receiver and design criterion.

It should be noted that the plant noise levels would meet the design criterion with the premises operating from 07:00.

5.3.2 Structureborne Noise

All plant and ductwork should be fitted with anti-vibration mounts in accordance with the manufacturer guidelines.

The extract fan will have a dominant case frequency of 50-60Hz. To mitigate this to remove the tonal element, the fan motor should be mounted on rubber or neoprene mounts with a minimum deflection of 5mm, which would provide 95% isolation efficiency, considerably more than the recommended minimum of 90% isolation.

The fan should be attached to the ductwork on either side using flexible coupling to minimise vibration transfer to the ductwork. Ductwork should be attached to the building using isolated fixings, with either a rubber or neoprene isolator with a minimum deflection of 1mm, which would provide 90% isolation, considerably more than would be required considering the reduced energy transmitted to the ductwork.

The above measures are to control structureborne noise and re-radiated noise to other areas of the building to considerably below current internal noise levels and hence would be considered acceptable.

5.4 Comparison to BS8233:2014 Criteria

BS8233 assumes a loss of approximately 15dB for a partially open window. The external noise level shown in Table 5.5 would result in internal noise levels that achieve the guidelines shown in Table 2.1.

6. Ground to First Floor Noise Transmission

The construction of the floor between ground and first floor level is currently unknown, as is the layout of the apartment above the kitchen area. To ensure a pessimistic assessment, it has been assumed that the space above the kitchen is a bedroom where noise levels should be controlled to the greatest degree. It has also been assumed that the floor build-up comprises floorboard, 215mm joists, and a plasterboard ceiling.

It is recommended that the ceiling above the kitchen is uprated undertaking the following works:

- Install additional layer of 15mm dense plasterboard or fireboard (minimum mass 11kg/m²) to underside of existing ceiling
- New metal frame grid attached to the existing ceiling using isolated hangers such as British Gypsum GAH1 hangers with grid at least 250mm below existing ceiling.
- New ceiling comprising 2 layers 15mm dense plasterboard (minimum mass 11kg/m²) installed on m.f. grid, 100mm mineral (minimum density 25kg/m³) to be installed in void above ceiling. Joints to be staggered and ceiling to be skimmed.

Following the fitting of the above system, it is expected that the in-situ sound insulation performance of the construction would be capable of providing a performance of $D_{nT,w} + C_{tr}$ 53dB.

7. BS4142 Noise Impact Assessment

Noise from a van delivering to the premises has been considered between the hours of 8:00 and 22:00.

7.1 Acoustic Character Correction

The subjective method of allocating corrections to the sound source has been used following the methodology provided in BS4142:2014 and summarised in section 2.2.

Noise Source	Subjective Description	Allocated Corrections
Delivery	Intermittent deliveries from van to premises	Tonality: 0 dB Impulsivity: +3 dB Intermittency: +3 dB

Table 7.1 – Acoustic character corrections

These penalties are applied to the specific noise level in section 7.2 to obtain the rating noise level.

7.2 Rating Noise Level and Assessment

The rating noise levels at the assessment locations are compared against the relevant background noise levels to assess the notional significance of the noise impact on the use on the apartment above.

Results		Relevant Clause	Commentary
Delivery noise	64 dB(A) @1m	7.3.4	From van delivering to premises
Distance Loss (5m)	-14 dB	7.3.5	
Assume 1 delivery per hour	-15 dB	7.2	
Specific Sound Level	L _{Aeq} 35 dB		
Acoustic feature correction	+6 dB	9.2	+3dB for impulsivity, +3dB for intermittency
Rating level	L _{Ar} 41 dB	9.2	
Background sound level	L _{A90} 39 dB	8	Operational hours
Excess of rating over background sound level	+2 dB	11	
Assessment indicates a marginal impact		11	Depending on context
Uncertainty and Context	The assessment has also assumed that deliveries occur during the opening hours, with the van assumed to be parked outside on the pavement. Noise levels from deliveries to the adjacent food premises are likely to be similar and so this is not a new noise source being introduced into the area.		

Table 7.2 – BS4142 Assessment – Delivery

Noise from customers collecting from the premises would be considerably lower, as there is no parking to the front of the premises, and so they would be likely to use the car park opposite the site and walk to collect orders.

The level of impact would remain the same when assessed using BS4142 if the premises opened at 07:00.

8. Conclusion

A baseline noise survey has been undertaken by Venta Acoustics to establish the background noise climate in the locality of 148 Parrock Street, Gravesend in support of a planning application for the proposed introduction of new building services plant.

This has enabled noise emission limits to be set at the most affected noise sensitive receiver such that the proposed installation meets the requirements of Gravesham Borough Council.

The predicted noise emission levels from the proposed plant have been assessed to be compliant with the plant noise emission limits, with necessary mitigation measures specified.

A review of the measures required to be implemented to uprate the sound insulation performance between ground and first floor as per the recommendations of the delegated report for the application.

When assessed using BS4142, noise associated with deliveries from the restaurant have been shown to have a marginal impact.

Considering the above, the proposed scheme is not expected to have a significant adverse noise impact and the relevant planning requirements have been shown to be met.

An assessment of the level of impact if the premises were to open at 07:00 rather than 08:00 shows that plant noise limits would still be met and the level of impact under BS4142 would remain the same with the slightly earlier opening time.

Jamie Duncan MIOA

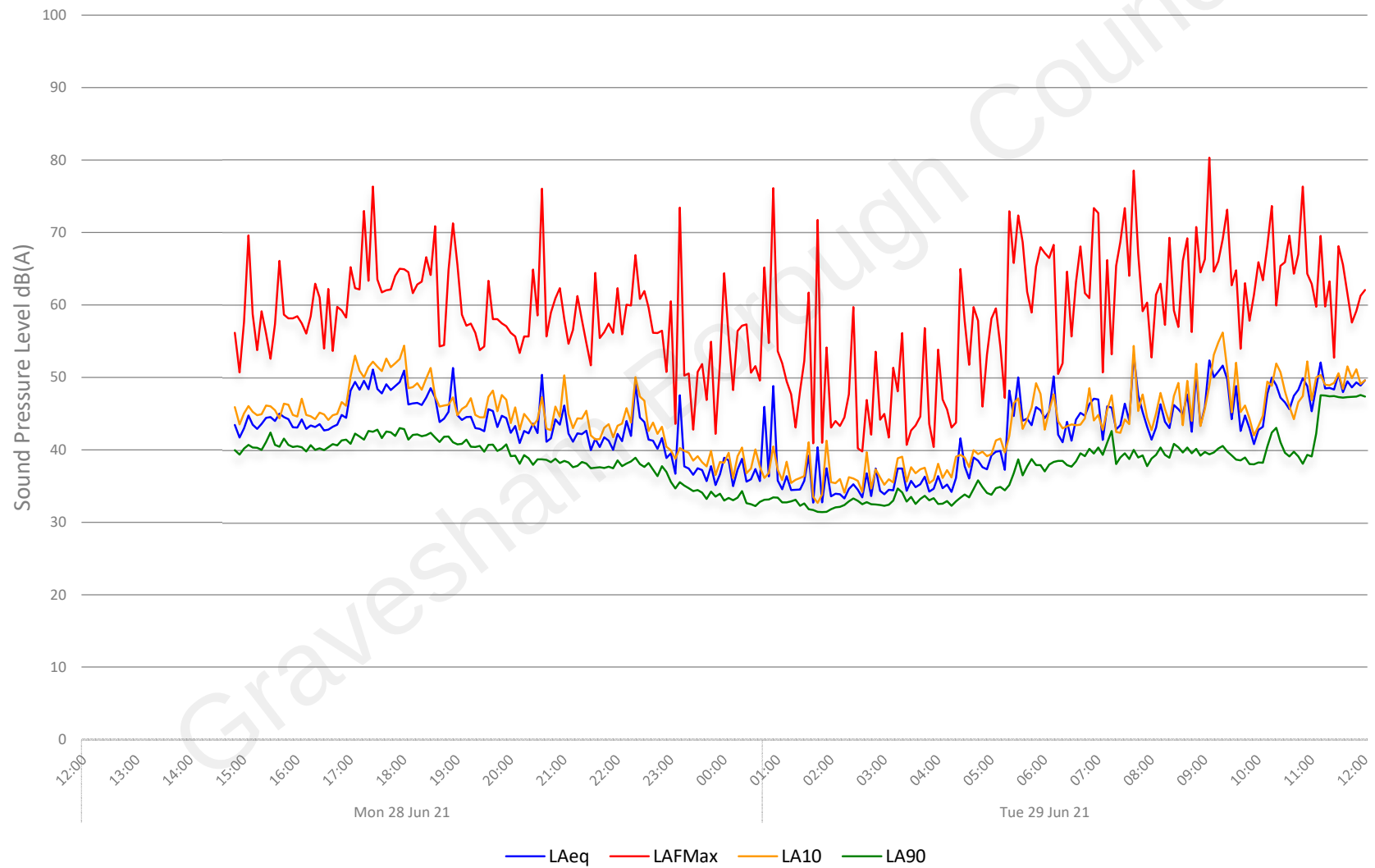


148 Parrock Street, Gravesend

Environmental Noise Time History: 1

 **VENTA** ACOUSTICS

Figure VA3730/TH1

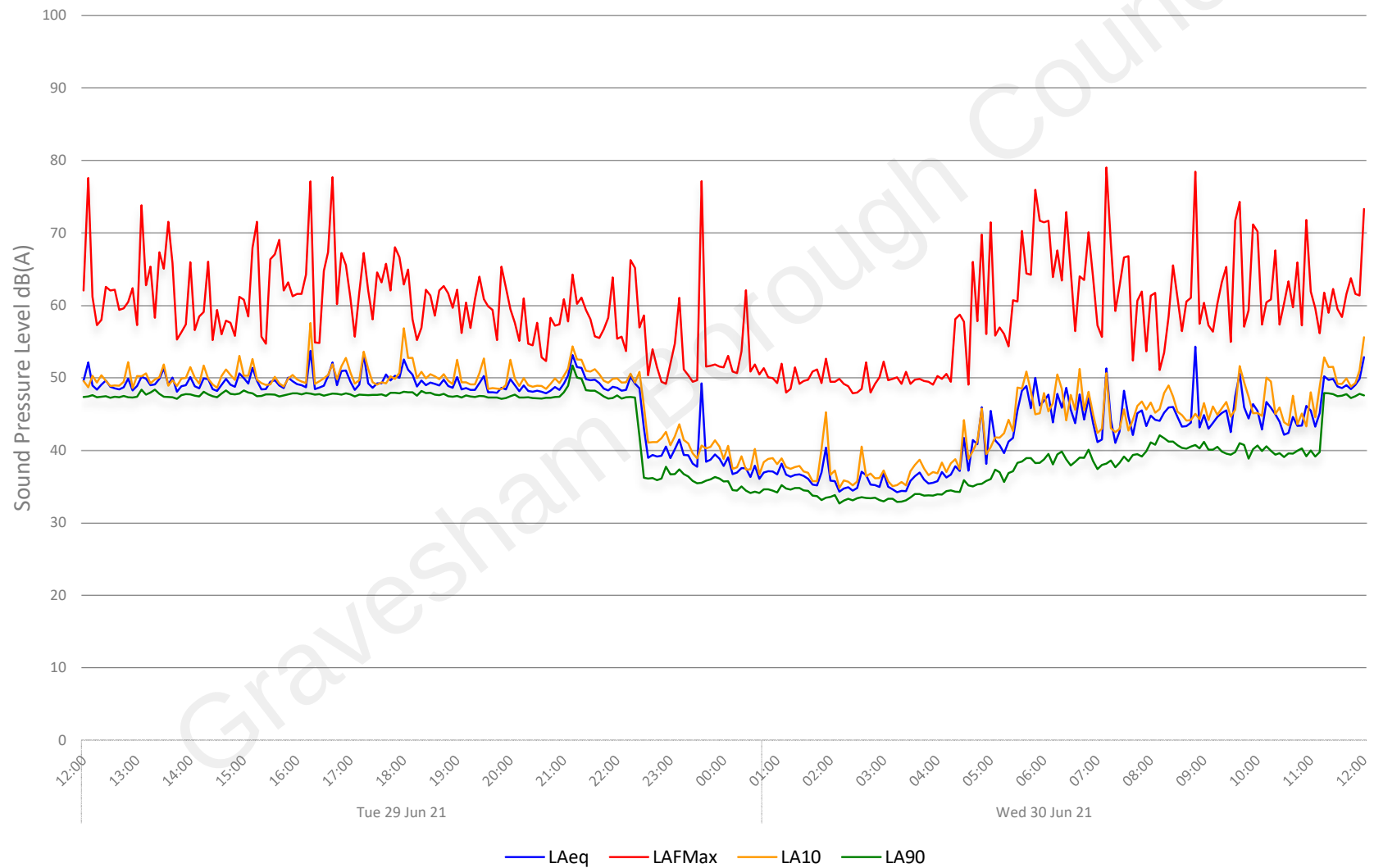


148 Parrock Street, Gravesend

Environmental Noise Time History: 2

 **VENTA** ACOUSTICS

Figure VA3730/TH2

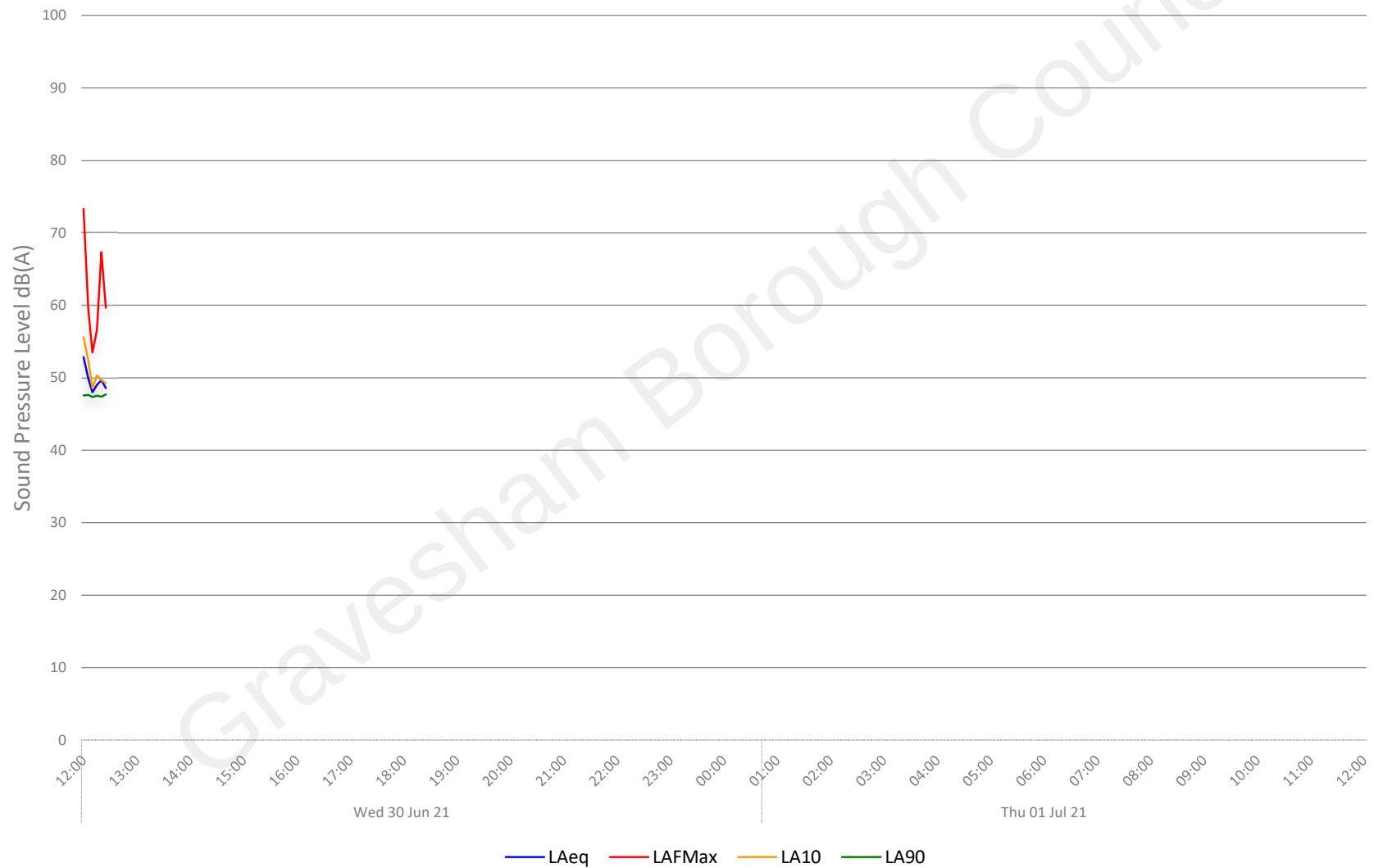


148 Parrock Street, Gravesend

Environmental Noise Time History: 3

 **VENTA** ACOUSTICS

Figure VA3730/TH3



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.
R	<i>Sound Reduction Index</i> . Effectively the <i>Level Difference</i> of a building element when measured in an accredited laboratory test suite in accordance with the procedures laid down in BS EN ISO 10140-2:2010 and corrected for its size and the reverberant characteristics of the receive room.

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

APPENDIX A

Acoustic Terminology & Human Response to Broadband Sound

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

APPENDIX B

VA3730 - 148 Parrock Street, Gravesend

Noise Impact Assessment

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Polestar 355 - Exhaust	Lw	69	71	78	72	71	70	69	67	78
Attenuator 1 - CPO03-CA-0355-1D		-2	-3	-5	-11	-13	-11	-10	-8	
Attenuator 2 - CPO03-CAP-0355-2D		-3	-10	-15	-22	-29	-30	-29	-22	
Distance Loss	To 2.5m	-8	-8	-8	-8	-8	-8	-8	-8	
Radiation correction		-11	-11	-11	-11	-11	-11	-11	-11	
Directivity (Hor:140,Vert:0)		-1	-2	-3	-7	-9	-8	-8	-8	
Level at receiver		44	38	36	13	2	2	3	10	29

* Screening loss limited to 18dB

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Polestar 355 - Breakout	Lw	59	53	56	49	46	42	47	43	54
Additional casing loss		-3	-6	-10	-13	-17	-22	-33	-38	
Distance Loss	To 4m	-12	-12	-12	-12	-12	-12	-12	-12	
Radiation correction		-8	-8	-8	-8	-8	-8	-8	-8	
Level at receiver		36	27	26	16	9	0	-6	-15	20

* Screening loss limited to 18dB

<u>BS4142 Assessment</u>				
BS4142 Character Corrections		Rating Levels		Expected Impact
Tonality	0	Specific Sound Level	29	Low impact
Impulsivity	0	Corrected SSL	29	
Intermittency	0	Background	39	
Total	0	Difference	-10	