



Park Lane Service Station, Bedhampton

Car Wash Noise Impact Assessment

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24019-R01E-SW
Client: Ironmoor Ltd
Date: 27/10/2025

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REVISION HISTORY

Revision	Date	Revision Details	Author	Checked
R01	09/03/2024	Original Issue	Susan Witterick BSc MIOA	Ben Tomlin BSc MIOA
R01A	19/06/2024	Updated for proposed site layout	Susan Witterick BSc MIOA	Ben Tomlin BSc MIOA
R01B	24/06/2024	Changed client name	Susan Witterick BSc MIOA	
R01C	23/07/2024	Updated for proposed site layout and equipment selection	Susan Witterick BSc MIOA	Ben Tomlin BSc MIOA
R01D	20/08/2024	Corrected property numbers. Added calibration certificate. Updated anticipated usage patterns.	Susan Witterick BSc MIOA	
R01E	27/10/2025	Amended screen height. Updated machine sound power level. Updated for permitted operational hours.	 Susan Witterick BSc MIOA	

1 INTRODUCTION

- 1.1 dBx Acoustics has been appointed by Ironmoor Ltd to provide a noise impact assessment for the proposed installation of a 2-bay Jet Wash at the Park Lane Service Station, Bedhampton, Havant PO9 3HQ. These will replace the existing jet wash unit on the site.
- 1.2 Accordingly, this report presents the results of a noise survey conducted at the site, and an assessment of the potential noise impact arising from the Jet Wash at the surrounding noise sensitive receptors.
- 1.3 A glossary of acoustic terminology is presented in Appendix A.

2 ACOUSTIC DESIGN CRITERIA

Havant Borough Council

- 2.1 The Havant Borough Local Plan (Core Strategy) (2011) policies CS16 and DM10 requires that the amenity of local residents shall be protected.
- 2.2 In accordance with Condition 3 of planning application reference APP/24/00502, the permitted hours of operation are 08:00h-22:00h (08:30h-21:00h on Sundays and Bank Holidays).
- 2.3 Condition 5 requires that the BS4142 rating level, $dB_{L_{Ar,Tr}}$ of noise from the proposed jet wash shall be no higher than the existing background noise levels $dB_{L_{A90}}$ measured during the relevant time period.

BS 4142:2014 'Methods for Rating and Assessing Industrial and Commercial Sound'

- 2.4 BS 4142:2014 sets out a procedure for assessing noise impact whereby a Noise Rating Level is determined and compared with the existing local Background Sound Level.
- 2.5 The Rating Level ($dB_{L_{Ar,Tr}}$) is evaluated from the Specific Noise Level by including cumulative corrections to account for factors such as distinguishable tone, impulsivity, intermittency or other readily distinguishable sound characteristics.
- 2.6 The assessment of the impact depends upon the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level. An initial estimate of the impact of the specific sound is made by subtracting the Background Sound Level from the Rating Level, while considering the following points:
 - a) Typically, the greater this difference, the greater the magnitude of the impact.
 - b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
 - c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
 - d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

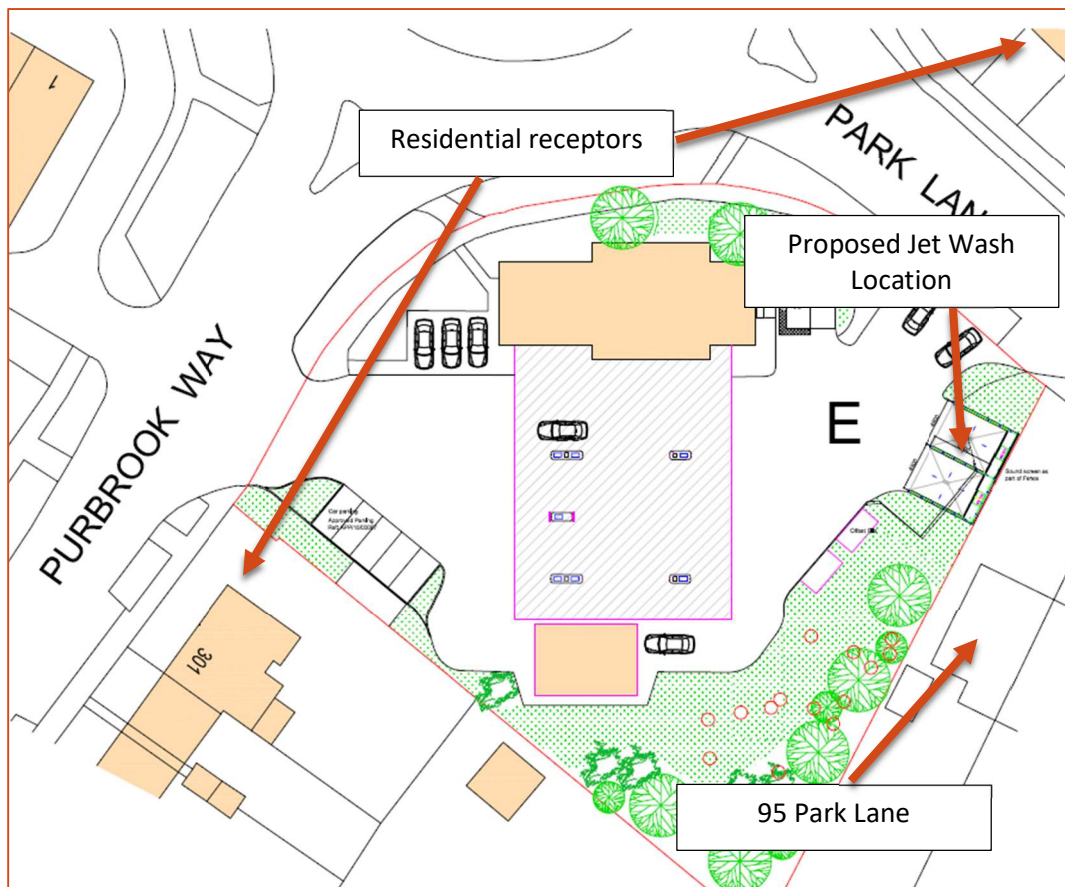
3 ENVIRONMENTAL NOISE SURVEY

- 3.1 An environmental noise survey was carried out between 08:00h on Tuesday 27th February 2024 and 10:15h on Thursday 29th February 2024.

Noise Sensitive Receptors

- 3.2 The nearby noise receptors (NSRs) used in the assessment have been identified on Figure 1. The nearest receptor to the proposed jet wash is housing at 95 Park Lane immediately to the south of the site. This property is owned by Ironmoor and occupied by the site operator.

Figure 1: Noise Sensitive Receptors



Weather Conditions

- 3.3 The temperature during the noise survey varied between 7°C-10°C. There were scattered showers on Wednesday 28th February, but analysis of the survey data indicates that this did not have any effect on the measured noise levels. Wind speeds during the survey averaged 4m/s.

Equipment Used

3.4 The equipment used during the noise survey is presented in Table 1, below.

Table 1: Equipment Used

Equipment	Manufacturer & Part No.	Serial Number	Calibration Date
Meter	Casella C633C	1716934	21/09/2023
Pre-Amp	CEL 495	001773	
Microphone	CEL 251	000847	
Calibrator	CEL 120/1	1530668	29/01/24

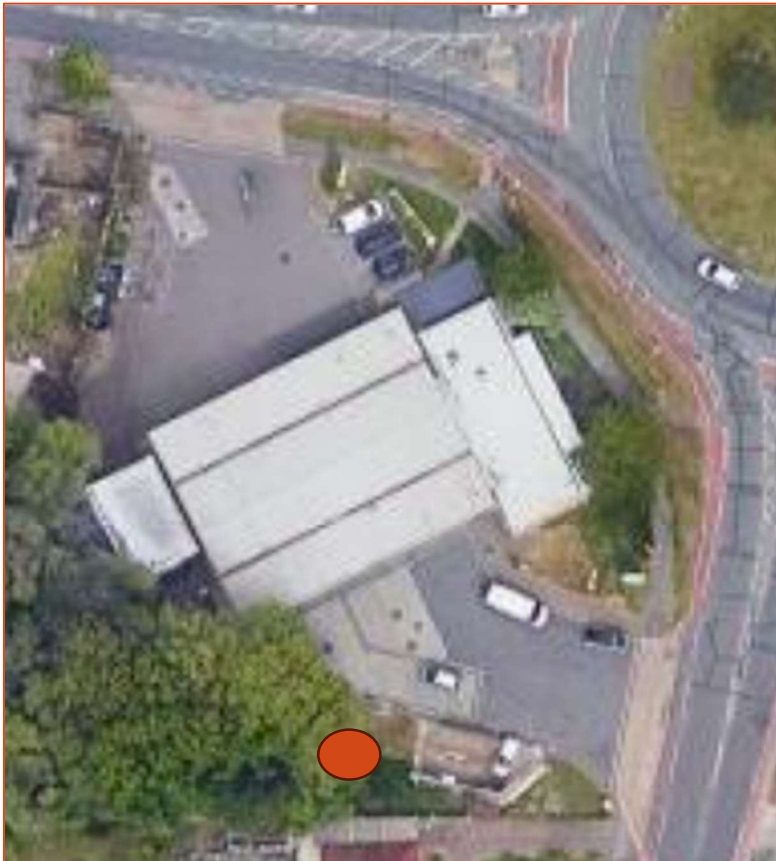
3.5 The sound level meter was calibrated before and after measurements, with no significant drift recorded. An accredited laboratory calibrated the equipment not more than two years prior to the measurements being made, with the exception of the calibrator, which had been calibrated not more than one year prior to the survey.

3.6 Calibration certificates are provided in Appendix B.

Measurement Location and Noise Climate

3.7 Noise levels were measured continuously at the southern boundary of the Service Station site, adjacent to 95 Park Lane, as shown in Figure 2, below.

Figure 2: Noise Monitoring Location



- 3.8 This measurement location was selected as representing the noise sensitive receptor with the least exposure to road traffic noise and potentially greatest exposure to noise from the proposed bays.
- 3.9 In accordance with Condition 3 of planning application reference APP/24/00502, the permitted hours of operation are 08:00h-22:00h. These hours have therefore been used as the basis of this assessment.
- 3.10 A summary of the noise levels measured is presented in Table 2, below.

Table 2: Measured Noise Levels

Date	Period	Ambient Noise Level, dBL _{Aeq,T}	Background Noise Level, dBL _{A90,T}
Tuesday 27 th February	08:00h-11:00h	62	55
	11:00h-19:00h	63	58
	19:00h-22:00h	59	56
Wednesday 28 th February	08:00h-11:00h	63	56
	11:00h-19:00h	63	57
	19:00h-22:00h	59	56

- 3.11 It can be seen that the measurements are consistent across the measurement periods, which is a good indication that the data gathered is representative of the noise climate at the surrounding residential receptors.
- 3.12 On this basis, the background noise levels used within this assessment are summarised in Table 3, below.

Table 3: Background Noise Levels Used in Assessment, dBL_{A90,T}

Period	95 Park Lane	116/118 Park Lane
08:00h-11:00h	55	60
11:00h-19:00h	57	62
19:00h-22:00h	56	61

4 SITE NOISE MODEL

- 4.1 A computer noise model of the site has been produced using the Soundplan 9.0 software package. OS Mastermap data has been used to model the site terrain and building footprints, as well as solid timber fencing to the surrounding residential properties where this was observed to exist during the site visit.
- 4.2 The proposed Jet Wash bays are modelled with 3.0m high screens (any material to achieve minimum 10kg/m²) to the sides and along the centre line between the bays.
- 4.3 The jet wash model is the Adriatech One Wash. dBx Acoustics has made measurements of this unit in operation at the All Saints Service Station.
- 4.4 On this basis, each jet wash bay has been modelled as a point noise source at 1.5m above ground with a sound power level of 90dBL_{WA}. This is broadly equivalent to 82dBA at 1m and therefore represents a worst-case for the noise impact assessment.
- 4.5 A screenshot from the model showing the noise sensitive receptors (green dots) and wash bays (blue dots) is presented as Figure 5.

Figure 3: Noise Model, 2D



5 ASSESSMENT

Model Results

- 5.1 With the model populated as described in Section 5, above, the specific noise level arising due to a worst-case condition with both bays in simultaneous operation has been calculated and is summarised in Table 4, below.
- 5.2 All results are presented at first floor level (4.5m above ground) to represent upper floor windows which obtain less benefit of acoustic screening due to fencing and intervening structures.

Table 4: Predicted Noise Levels

Receptor	95 Park Lane (South of site) – Front Facade	95 Park Lane (South of site) – Rear Facade	116-118 Park Lane (East of site)	301 Purbrook Way (Rear)
Specific Noise Level, $dB_{L_{Aeq,T}}$	49	35	46	43

- 5.3 On this basis, it can be seen that the worst affected receptors are at the front façade of 95 Park Lane and 116-118 Park Lane. The assessment therefore concentrates on these receptors.

Detailed Assessment

- 5.4 As a worst case, it has been assumed that all bays could be in constant and simultaneous use during the daytime period (08:00h-22:00h). Based on the anticipated typical usage pattern, and an 8-minute wash cycle, the following corrections can be made to the predicted noise levels in Table 4, above.
- 5.5 The anticipated wash pattern (bays in use and number of wash cycles per hour), along with the associated correction, is shown in Calculation 1, below. Corrections for the number of bays in use are based on $10 \log n \text{ dB}$ where n is the number of bays in use. Corrections for the number of wash cycles are made on the basis of $10 \log (T/60)$ where T is the total number of wash cycle minutes anticipated per hour.

Calculation 1: Corrections for Likely Usage

Time	Bays in use	Bay correction, dB	Washes per hour per bay	Wash Minutes per hour per bay	Time correction, dB	Total correction applicable, dB
0800-0900	2	0	4	32	-3	-3
0900-1100	2	0	4	32	-3	-3
1100-1500	2	0	7	56	0	0
1500-1900	2	0	7	56	0	0
1900-2200	2	0	4	32	-3	-3

- 5.6 On this basis, whilst no correction to the predicted specific sound levels can be applied for a worst-case 1-hour assessment period during the period to 19:00h, a -3dB correction can be applied for operation in the morning period 08:00h-11:00h and evening period 19:00h-22:00h
- 5.7 As indicated by measurements made by dBx Acoustics for similar installations, no BS4142 character correction associated with tonality is required for operation of the Jet Wash.
- 5.8 It would, however, be anticipated that sound from the Jet Wash would be acoustically distinctive, and as such a +3dB character correction is applied within this assessment as

described in BS4142:2014 section 9.2. The specific noise levels used in the BS4142 assessment are therefore summarised in Table 5, below.

Table 5: Specific Noise Level Used in Assessment, $dBL_{Aeq,1hr}$

Receptor	Assessment Period	Uncorrected Predicted Noise Level, $dBL_{Aeq,1hr}$ (Table 4)	Correction for Time and Number of Bays (Calculation 1), dB	Acoustic Character Correction	Rating Level, $dBL_{Aeq,1hr}$
95 Park Lane Front	08:00h-11:00h	49	-3	+3	49
	11:00h-19:00h	49	0		52
	19:00h-22:00h	49	-3		49
116-118 Park Lane	08:00h-11:00h	46	-3		46
	11:00h-19:00h	46	0		49
	19:00h-22:00h	46	-3		46

- 5.9 On this basis, the rating level in accordance with BS4142:2014 is presented in Table 6, below, with reference to the background noise level.

Table 6: BS4142 Rating Level vs Background

Receptor	Assessment Period	Rating Level, $dBL_{Ar,Tr}$	Background Noise Level, $dBL_{A90,1hr}$	Difference	Meets Requirements?
95 Park Lane Front	08:00h-11:00h	49	55	-6dB	Yes
	11:00h-19:00h	52	57	-5dB	Yes
	19:00h-22:00h	49	56	-7dB	Yes
116-118 Park Lane	08:00h-11:00h	46	60	-14dB	Yes
	11:00h-19:00h	49	62	-13dB	Yes
	19:00h-22:00h	46	61	-15dB	Yes

- 5.10 It can therefore be seen that the predicted BS4142 rating level at the nearest noise sensitive receptors is equal to or below the background noise level at all times throughout the permitted operating hours and would therefore not be expected to adversely impact residential amenity.
- 5.11 The context of the BS4142 assessment is that the residential receptors are in a busy urban area. The existing noise climate includes traffic noise as well as vehicle movements associated with the existing Park Lane Service Station and the existing jet wash. 95 Park Lane, the worst affected receptor, is owned by Ironmoor and occupied by the site operator.

6 CONCLUSION

- 6.1 A noise survey and noise impact assessment have been carried out for the proposed installation of a 2-bay Jet Wash at Park Lane Service Station, Bedhampton, Havant PO9 3HQ.
- 6.2 Based on the noise survey, background noise levels at the nearest noise sensitive receptors have been established for the permitted operating hours of 08:00h-22:00h.
- 6.3 A noise model of the proposed development has been created using the Soundplan 9.0 software package. This has been populated with the proposed Jet Wash noise sources based on data for the proposed Adriatech One Wash unit as measured by dBx Acoustics at other sites.
- 6.4 Relevant corrections have been made for the anticipated intensity of use of the Jet Wash.
- 6.5 It is demonstrated that the requirements of Havant BC under Planning Condition 4 of application reference APP/24/00502 can be met throughout the period 08:00h-22:00h with both bays in operation.

APPENDIX A – GLOSSARY OF ACOUSTIC TERMINOLOGY

Decibel, dB	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure level (L_p) the reference quantity is 2×10^{-5} N/m ² . The sound pressure level existing when microphone measured pressure is 2×10^{-5} N/m ² is 0 dB, the threshold of hearing.
L	Instantaneous value of Sound Pressure Level (L_p) or Sound Power Level (L_w).
Frequency	Number of cycles per second, measured in hertz (Hz), related to sound pitch.
A-weighting	Arithmetic corrections applied to values of L_p according to frequency. When logarithmically summed for all frequencies, the resulting single "A weighted value" becomes comparable with other such values from which a comparative loudness judgement can be made, then, without knowledge of frequency content of the source.
$L_{eq,T}$	Equivalent continuous level of sound pressure which, if it actually existed for the integration time period T of the measurement, would possess the same energy as the constantly varying values of L_p actually measured.
$L_{Aeq,T}$	Equivalent continuous level of A weighted sound pressure which, if it actually existed for the integration time period, T, of the measurement would possess the same energy as the constantly varying values of L_p actually measured.
$L_{n,T}$	L_p which was exceeded for n% of time, T.
$L_{An,T}$	Level in dBA which was exceeded for n% of time, T.
L_{Fmax}	The instantaneous maximum sound pressure level which occurred during the measurement. F indicates that the fast time-weighting is used.
L_{AFmax}	The instantaneous maximum A weighted sound pressure level which occurred during the measurement. F indicates that the fast time-weighting is used.
$L_{Ar,Tr}$	The rating level: the equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise.
Reverberation Time, T	The time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped. The descriptor T, often includes other nomenclature to describe the type of reverberation time measurement or if the reverberation time is an average taken for specific frequencies. For example, a T_{mf} is the mid-frequency reverberation time.
Absorption Coefficient, α	The fraction of reverberant sound energy absorbed by a material. It is expressed as a value between 1.0 which equates to perfect absorption and 0 which equates to zero absorption.
Acoustic Class, A - E	Classification of sound absorbers into Sound Absorption Classes A-E, according to BS EN ISO 11654, including frequencies 200-5000 Hz
NRC	A single-number rating system used to compare the sound-absorbing characteristics of building materials. A measurement of the acoustical absorption performance of a material, calculated by averaging its Sound Absorption Coefficients at 250, 500, 1000 and 2000 Hz
STI	Speech Transmission Index , Metric ranging between 0 and 1 representing the transmission quality of speech with respect to intelligibility by a speech transmission channel
R	Sound Reduction Index , the laboratory measured sound insulation properties of a material or building element in octave or third octave bands.
R_w	Weighted Sound Reduction Index , a single number which represents the sound reduction of a material. It is derived by plotting the sound reduction index against a set of reference curves. The curves are shifted until a best-fit is established and the curve which best fits the sound reduction spectrum is used to represent the single figure value.
D_w	Weighted Level Difference , the weighted level difference between a pair of rooms, stated as a single figure.

D_{nT}	<p>Standardised Level Difference, a frequency-dependent measurement of airborne sound insulation, calculated using the following formula: $D_{nT} = L_1 - L_2 + 10\log(T/T_0)$ dB Where: L_1 is the energy-averaged sound pressure level due to the pink noise source measured in the source room using a sweep technique. L_2 is the energy-averaged sound pressure level measured in the receiving room using a sweep technique. T is the mean receiving room reverberation time (derived from T_{30} measured in seconds). T_0 is the reference reverberation time (= 0.5s for dwellings).</p>
$D_{nT,w}$	<p>Weighted Standardised Level Difference, a single-figure value of airborne sound insulation performance, derived according to procedures in BS EN ISO 717-1, based on the D_{nT} values at different frequencies (100-3150 Hz third octave bands).</p>
$D_{n,F,w}$	<p>Weighted, Normalised Flanking Level Difference, the normalised, weighted difference in sound level between a pair of rooms via a flanking element, such as mullion or ceiling detail. The level difference in octave bands is first normalized to a reference amount of absorption and then plotted against a set of reference curves to establish a single figure value.</p>
D_{ne}	<p>Normalised Element Level Difference. The normalised difference in sound level between a pair of rooms via a small element such as a trickle ventilator. The level difference in octave bands is normalized to a reference amount of absorption.</p>
$D_{n,e,w}$	<p>Weighted, Normalised Element Level Difference. The normalised, weighted difference in sound level between a pair of rooms via a small element such as a trickle ventilator, stated as a single figure. The level difference in octave bands is normalized to a reference amount of absorption and then plotted against a set of reference curves to establish a single figure value.</p>
C_{tr}	<p>Spectrum Adaptation Term, a correction term applied to the sound insulation single-number values (R_w, D_w, and $D_{nT,w}$) in accordance with BS EN ISO 717-1. Applying the C_{tr} penalises a construction's performance if its low frequency performance is poor in relation its performance at higher frequencies.</p>
Impact Sound	<p>The noise generated by an impact on a structure. This is normally used to describe the noise created by people walking or moving furniture on a floor structure.</p>
L_{nT}	<p>Standardised Impact Sound Pressure Level, a frequency dependent measurement of impact sound insulation, calculated using the following formula: $L_{nT} = L_1 + 10\log(T/T_0)$ dB Where: L_1 is the mean sound pressure level due to the tapping machine measured in the receiving room using a sweep technique. T is the mean receiving room reverberation time (derived from T_{30} measured in seconds). T_0 is the reference reverberation time (0.5s for dwellings)</p>
$L'_{nT,w}$	<p>Weighted Standardised Impact Sound Pressure Level, a single-figure value (@ 500 Hz) of impact sound insulation, performance, derived according to BS EN ISO 717-2, based on the L_{nT} values at different frequencies (100Hz- 3150 Hz third octave bands).</p>
Insertion Loss, IL	<p>The reduction of noise level due to the presence of a noise control device such as an attenuator, excluding any regeneration noise created by its presence.</p>
NR	<p>The Noise Rating level. This is a single figure value derived by plotting a noise spectrum against a set of curves. The curve under which the spectrum fits is the resulting NR level.</p>

APPENDIX B – CALIBRATION CERTIFICATES

www.casellasolutions.com

CASELLA
A DIVISION OF TS

Certificate of Conformity and Calibration

Instrument Model:- CEL-633C

Serial Number 1716934

Firmware revision V006-05

Microphone Type:- CEL-251

Serial Number 6682

Preamplifier Type:- CEL-495

Serial Number 001773

Instrument Class/Type:- 1

Applicable standards:-

IEC 61672: 2013 / EN 60651 (Electroacoustics - Sound Level Meters)

IEC 60651 1979 (Sound Level Meters), ANSI S1.4: 1983 (Specifications For Sound Level Meters)

Note:- The test sequences performed in this report are in accordance with the current Sound level meter Standard - IEC61672. The combination of tests performed are considered to confirm the products electro-acoustic performance to all applicable standards including superceded Sound Level Meter Standards - IEC60651 and IEC60804.

Test Conditions:- 23 °C
47 %RH
989 mBar

Test Engineer:- J. Robinson
Date of Issue:- September 21, 2023

Declaration of conformity:-

This test certificate confirms that the instrument specified above has been successfully tested to comply with the manufacturer's published specifications. Tests are performed using equipment traceable to national standards in accordance with Casella's ISO 9001:2015 quality procedures. This product is certified as being compliant to the requirements of the CE Directive.

Test Summary:-

Self Generated Noise Test	All Tests Pass
Electrical Signal Test Of Frequency Weightings	All Tests Pass
Frequency & Time Weightings At 1 kHz	All Tests Pass
Level Linearity On The Reference Level Range	All Tests Pass
Toneburst Response Test	All Tests Pass
C-peak Sound Levels	All Tests Pass
Overload Indication	All Tests Pass
Acoustic Tests	All Tests Pass

Combined Electro-Acoustic Frequency Response - A Weighted

Combined Electro-Acoustic Frequency Response - A Weighted (IEC 61672-3:2006)

The following A-Weighted frequency response graph shows this Instruments overall frequency response based upon the application of multi-frequency pressure field calibrations. The microphones Pressure to Free field correction coefficients are applied to pressure response. Reference level taken at 1kHz.

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Certificate of Conformity and

Instrument Model	CEL-633C	Preamplifier Type	CEL-495
Serial Number	1716934	Serial Number	001773
Firmware revision	V006-05		
Microphone Type	CEL-251		
Serial Number	6682		
Instrument Class/Type	1		

Applicable standards:-

IEC 61672: 2013 / EN 60651 (Electroacoustics - Sound Level Meters)
 IEC 60651 1979 (Sound Level Meters), ANSI S1.4: 1983 (Specifications For Sound Level Meters)

Note:- The test procedures performed in this report are in accordance with the current Sound level meter Standard - IEC61672. The combination of tests performed are considered to confirm the products electro-acoustic performance to all applicable standards including superseded Sound Level Meter Standards - IEC60651 and IEC60804.

Test Conditions:-

Temperature	23	°C
Humidity	47	%RH
Pressure	989	mBar

Test Engineer:- J. Robinson

Date of Issue:- September 21, 2023

Equipment Used

Customer's Calibrator:	N/A	Serial Number:	
Fixed Frequency Calibrator:	CEL- 125/1	Serial Number:	EQ11084
Multi-Frequency Calibrator:	B&K-4226	Serial Number:	EQ11294
Signal Generator:	Stanford Research Systems DS360	Serial Number:	49032

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Toneburst Response Test	All Tests Pass
C-peak Sound Levels	All Tests Pass
Overload Indication	All Tests Pass
Acoustic Tests	All Tests Pass



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Tested to CEL-633C test sheet TP444 revision 08-00

CEL-633C_1 Ser 1716934_001773_6682

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Calibration Results

Indication At Calibration Check Frequency (IEC 61672-1:2013)

IEC 61672-3 specifies checking the indication of the sound level meter at the calibration frequency. If possible, this is carried out with the customer's calibrator, otherwise the fixed frequency calibrator is used. If necessary, the instrument is adjusted for the correct level. The level before the adjustment and after are recorded. An A-weighted, SPL measurement is made on the reference range.

A wgt. dB (before adjustment)	A wgt. dB (after adjustment)
0.0	114.0

Self-Generated Noise (IEC 61672-1:2013)

IEC 61672-1:2013 specifies measuring the self-generated noise with the microphone installed (A-weighted) and with an electrical input (all weightings). Limits are to the manufacturer's published specifications.
Note: Noise floor level may be below LCD display range. Value is extracted electronically.

A wgt. dB (microphone installed)	Pass	NOTE this maximum level takes into account the expanded uncertainty
Level 160.2 dB 19.88 dBA?		

Electrical Input

Parameter	Indicated Leq (dB)	Expanded Uncertainty (dB)	Noise Extended By Uncertainty (dB)	Maximum Limit (dB)
A-weighted	12.0	0.12	12.02	17.5
C-weighted	15.6	0.12	15.75	21.0
Z-weighted	21.7	0.12	21.78	24.5

Self-Generated Noise

All Tests Pass

Electrical Signal Tests of Frequency Weightings (IEC 61672-1:2013)

A and 'C' frequency weightings are tested in compliance to IEC61672-3:2005. Test method is as described by IEC61672-3:2005, such that an inverse A-weighted signal is applied. The 1 kHz reference point is taken at -45 dB from the top of the reference range. The limits applied are one-third of the total limits defined in IEC61672-01:2002.

A Weighting Response

Frequency response relative to reference level at 1kHz. The applied signal is an inverse A-weighted signal. Established via measurement of LAeq.

Applied Frequency (Hz)	Indicated LAeq (dB)	Relative Attenuation (dB)	Target A-weighted Response (dB)	Error (dB)	Expanded Uncertainty (dB)	Error Extended By Uncertainty (dB)
50	94.9	-25.3	-66.9	-0.1	0.19	-0.29
125	94.9	-19.2	-16.1	-0.1	0.19	-0.29
250	94.9	-4.7	-6.6	-0.1	0.19	-0.29
500	94.9	-2.2	-3.2	-0.1	0.19	-0.29
1000	95.0	0.0	0.0	0.0	0.00	0.00
2000	94.9	1.1	1.2	-0.1	0.19	-0.29
4000	94.9	0.9	1.0	-0.1	0.19	-0.29
8000	94.9	-1.5	-1.1	-0.4	0.19	-0.59
16000	92.0	-9.6	-8.6	-3.0	0.19	-3.19

Error Limits (dB)	
min	max
-0.5	0.5
-0.5	0.5
-0.5	0.5
-0.5	0.5
-0.4	0.4
-0.5	0.5
-0.5	0.5
-1.0	0.7
-5.7	1.2

A Weighting Tests

All Tests Pass

C Weighting Response

Frequency response relative to reference level at 1kHz. The applied signal is an inverse C-weighted signal. Established via measurement of LCeq.

Applied Frequency (Hz)	Indicated LCeq (dB)	Relative Attenuation (dB)	Target C-weighted Response (dB)	Error (dB)	Expanded Uncertainty (dB)	Error Extended By Uncertainty (dB)
50	94.9	-0.9	-0.8	-0.1	0.19	-0.29
125	94.9	-0.2	-0.2	0.0	0.19	0.19
250	94.9	-0.1	0.0	-0.1	0.19	-0.29
500	94.9	0.0	0.0	0.0	0.19	0.19
1000	94.9	0.0	0.0	0.0	0.00	0.00
2000	94.9	-0.2	-0.2	0.0	0.19	0.19
4000	94.9	-1.0	-0.8	-0.2	0.19	-0.39
8000	94.9	-3.4	-2.0	-0.4	0.19	-0.59
16000	92.0	-11.5	-6.5	-3.0	0.19	-3.19

Error Limits (dB)	
min	max
-0.5	0.5
-0.5	0.5
-0.5	0.5
-0.5	0.5
-0.4	0.4
-0.5	0.5
-0.5	0.5
-1.0	0.7
-5.7	1.2

C Weighting Tests

All Tests Pass

Z Weighting Response

Frequency response relative to reference level at 1kHz. Established via measurement of LZeq.

Applied Frequency (Hz)	Indicated LZeq (dB)	Relative Attenuation (dB)	Target Z-weighted Response (dB)	Error (dB)	Expanded Uncertainty (dB)	Error Extended By Uncertainty (dB)
50	94.9	-0.1	0.0	-0.1	0.19	-0.29
125	94.9	0.0	0.0	0.0	0.19	0.19
250	94.9	-0.1	0.0	-0.1	0.19	-0.29
500	94.9	0.0	0.0	0.0	0.19	0.19
1000	95.0	0.0	0.0	0.0	0.00	0.00
2000	94.9	-0.1	0.0	-0.1	0.19	-0.29
4000	94.9	-0.1	0.0	-0.1	0.19	-0.29
8000	94.9	-0.1	0.0	-0.1	0.19	-0.29
16000	91.7	-6.9	0.0	-6.9	0.19	-7.09

Error Limits (dB)	
min	max
-0.5	0.5
-0.5	0.5
-0.5	0.5
-0.5	0.5
-0.4	0.4
-0.5	0.5
-0.5	0.5
-1.0	0.7
-5.7	1.2

Z Weighting Tests

All Tests Pass

C' Peak Sound Levels (IEC 61672-1:2013)

IEC 61672-1:2013 section 17: Reference level of steady signal is measured (LCeq) at both test frequencies.
The deviations of LCpeak from the steady state LC reference level are noted for a variety of input pulse cycles and frequencies, with errors checked to be within limits given in IEC 61672-1:2002 Table 4.

Number of Cycles	LCeq Ref (dB)	LCpeak (dB)	LCpeak - LCeq Ref (dB)	Target (dB)	Error (dB)	Expanded Uncertainty (dB)	Error Extended By Uncertainty (dB)
One, 400 Hz	128.6	131.6	3.0	3.4	-0.4	0.25	-0.65
Positive, 500 Hz	132.0	134.2	2.2	2.4	-0.2	0.25	-0.45
Negative, 600 Hz	132.0	134.2	2.2	2.4	-0.2	0.25	-0.45

Error Limits (dB)	
min	max
-0.4	2.4
-1.4	1.4
-1.4	1.4

Peak C weighting tests

All Tests Pass

Overload Indication Test (IEC 61672-1:2013)

IEC 61672-1:2013 section 18: Starting level is taken as a steady signal creating an approximate indication 1 dBA below the upper linear range (140 dB) at 4 kHz. Therefore, the starting level is 139 dB(A for 137 dBZ). Single positive and negative pulses are applied and steadily increased in 0.1 dB steps, above the starting level. The level at which overload first occurs for positive and negative signals is recorded. The difference between the input levels that caused the two overloaded indications is then checked to conform to IEC 61672-1:2002 section 6.10.3.

Starting Level (dB)	Input Level That Caused Overload		Difference Between Positive and Negative Overload Points (dB)	Expanded Uncertainty (dB)	Difference Between Positive and Negative Overload Points Extended By Uncertainty (dB)
	Positive Half-Cycle	Negative Half-Cycle			
138.9	141.3	141.3	0.0	0.28	0.28

Error Limits (dB)	
min	max
-1.6	1.6

Check overload is not on too early

not on before:-

140

dBZ (peak)

Overload Indication Test

All Tests Pass

Combined Electro-Acoustic Frequency Response - A Weighted (IEC 61672-1:2013)

IEC 61672-1:2013 section 11: Tests performed using multi-frequency pressure calibrator with microphone pressure to free field corrections applied. Reference level taken at 1kHz.

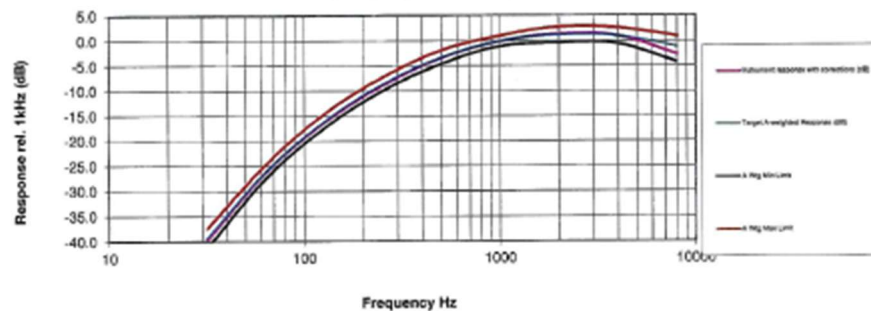
NOTE: The 'Overall Corrections' column in the table below includes corrections for pressure to free-field, case reflections & windshield.

Applied Frequency (Hz)	Indicated LAF (dB)	Overall Corrections (dB)	Instrument response with corrections (dB)	Target A-weighted Response (dB)	Error (dB)	Expanded Uncertainty (dB)	Error Extended By Uncertainty (dB)
21.5	72.8	0	-39.7	-39.4	-0.3	0.31	-0.61
40	82.2	0	-38.9	-38.2	-0.7	0.31	-1.01
125	98.2	0	-18.2	-16.1	-2.1	0.31	-2.41
250	103.7	0	-8.8	-8.6	-0.2	0.32	-0.52
500	109.1	0.1	-3.3	-3.2	-0.1	0.32	-0.42
Ref. 1000	112.3	0.2	0.0	0.0	0.0	0.27	0.27
2000	115.2	0.7	1.4	1.2	0.2	0.34	0.55
4000	111.8	1.7	1.5	1.0	0.5	0.36	0.86
8000	107.2	2.7	-2.8	-1.1	-1.5	0.56	-2.00

Error Limits (dB)	
min	max
-2.50	2.50
-1.50	1.50
-1.50	1.50
-1.40	1.40
-1.40	1.40
-1.10	1.10
-1.00	1.00
-1.00	1.00
-0.10	0.10

Sensitivity

Pass

Overall Electro-Acoustic Frequency response - 'A' Weighted.

Acoustic Tests

All Tests Pass

CASELLA

**Certificate of
Conformance and Calibration for**

CEL-120 Acoustic Calibrator

Applicable Standards :- IEC 60942: 2003 & ANSI S1.40: 2006

CEL-120/1 Class 1 ☒

CEL-120/2 Class 2 ☐

Serial No: 1530668

Firmware: 04

Temperature: 21.7 °C Pressure: 10.32 mb %RH 37

Frequency = 1.00kHz ± 2Hz T.H.D. = < 1%	Calibration Level
SPL @ 114.0dB Setting	<u>114.01</u> dB
SPL @ 94.0dB Setting (CEL-120/1 only)	<u>93.95</u> dB/N.A

Engineer: [Signature] Date: 29 JAN 2024

Company test equipment and acoustic working standards, used for conformance testing, are subject to periodic calibration, traceable to UK national standards, in accordance with the company's ISO9001 Quality System.

DECLARATION OF CONFORMITY

This certificate confirms that the instrument specified above has been produced and tested to comply with the manufacturer's published specifications and the relevant European Community CE directives.

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