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December 13, 2017

Mr. Dave Kiff
City Manager
City of Newport Beach, California
100 Civic Center Drive
Newport Beach, CA 92660

Subject: Review of the Annual Preventative Maintenance and Calibration Report Conducted by BridgeNet International for John Wayne Airport (SNA)

Reference: HMMH Project Number 309550

Dear Mr. Dave Kiff:

Per your request, HMMH reviewed the 2017 annual preventative maintenance and calibration report for the County of Orange, owner and operator of John Wayne Airport (SNA). According to the October 11, 2017 Memo, BridgeNet International completed annual preventative maintenance and calibration for the ten (10) permanent noise-monitoring terminals in the communities surrounding SNA September 28-29, 2017 and again on October 11, 2017[1]. Each of the permanent noise monitoring terminals includes a Type I sound level meter, Bruel & Kjaer Type 2250, as the instrument measuring aircraft noise and calibrated each year to show their continued accuracy.

The sound level meters at each of the noise monitoring terminals were calibrated with a Bruel & Kjaer Type 4228 pistonphone (Serial #2959463). According to the Odin Metrology, Inc. certificate of calibration, this pistonphone was within the manufacturer's specifications at the time of the annual preventative maintenance and calibration of the SNA noise monitoring terminals.

HMMH reviewed the BridgeNet International preventative maintenance and calibration checklist (Microsoft Excel spreadsheet) provided as an attachment to their memo. The table below summarizes the results of the acoustical calibration of the sound level meters for all ten (10) noise-monitoring terminals. Each sound level meter was calibrated twice on October 11, 2017; the second calibration is required to result in a deviation of 0.00 for all microphones as verified in the BridgeNet International Microsoft Excel spreadsheet and summarized in the table below. It is our expert opinion that BridgeNet International appropriately and successfully calibrated the sound level meters on October 11, 2017 at each of the noise monitoring terminals as shown in the table below.

NMT #	NMT Location	Calibration	Deviation from Last Calibration
1S	3100 Irvine Avenue, Newport Beach	Successful	-0.03, 0.00
2S	20162 Birch Street, Newport Beach	Successful	-0.09, 0.00
3S	2139 Anniversary Lane, Newport Beach	Successful	0.08, 0.00
4S	2338 Tustin Avenue, Newport Beach	Successful	0.01, 0.00
5S	324 ½ Vista Madera, Newport Beach	Successful	0.00, 0.00
6S	1912 Santiago, Newport Beach	Successful	-0.01, 0.00
7S	1311 Back Bay Drive, Newport Beach	Successful	-0.01, 0.00

[1] According to the John Wayne Airport Access and Noise Office, BridgeNet International returned to each of the noise monitoring terminals on October 11, 2017 and repeated the calibrations due to issues and concerns raised by the SNA staff with the initial preventative maintenance and calibration conducted September 28-29, 2017.

8N	17372 Eastman Street, Irvine	Successful	-0.08, 0.00
9N	1300 S. Grand Avenue, Santa Ana	Successful	-0.01, 0.00
10N	17952 Beneta Way, Tustin	Successful	0.29[2], 0.00

The Bruel & Kjaer Type 2250 sound level meters at each noise monitoring terminal location are in accordance with the American National Standards Institute (ANSI) standards S1.4-1983 as amended by S1.4A-1985[3] for Type 1 precision sound level meters as well as the newer International Electrotechnical Commission (IEC) 61672-1.

If you have any questions or concerns related to the results of our review including our expert opinion, please do not hesitate to contact me.

Sincerely yours,

Harris Miller Miller & Hanson Inc.

Justin W. Cook - INCE, LEED GA
Principal Consultant

Enclosures: Memorandum, Annual Preventative Maintenance and Calibration of the Noise Monitoring System, BridgeNet International, October 11, 2017

Certificate of Calibration for Bruel & Kjaer Pistonphone, Certificate Number: 22082-1, Odin Metrology, Inc., January 18, 2016.

cc: Gene Reindel, HMMH Vice President

[2] Although the first calibration of the sound level meter at 9N resulted in a deviation by more than a tenth of a dB, which is not expected, it is still within the tolerance of ±0.7 dB allowed within the ANSI standards.

[3] The State of California requires aircraft noise monitoring systems meet ANSI for Sound Level Meters, Type I, per Title 21 of the California Department of Transportation, Division of Aeronautics, Subchapter 6 – Noise Standards, paragraph 5080.3 Performance Specifications, Section (b) (1)
http://dot.ca.gov/hq/planning/aeronaut/documents/regulations/statenoisestnds.pdf

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MEMO

October 11, 2017

John Wayne Airport
Access and Noise Office
3160 Airway Avenue
Costa Mesa, CA 92626

Subject: Annual Preventative Maintenance and Calibration of the Noise Monitoring System

Annual preventative maintenance and calibration was completed by BridgeNet International on September 28 and 29, 2017 and sites were revisited on October 11, 2017 for all ten noise monitoring terminals.

The microphones were calibrated with a Brüel & Kjær Type 4228 Pistonphone with Serial #2959463.

Specific details regarding the ten noise monitoring terminals that had annual preventative maintenance and calibration performed on can be found in a preventative maintenance checklist excel document provided with this document.

Sincerely,

Mark Karmelich

BridgeNet International
Mark Karmelich | Vice President – Information Technology
C: 310-420-6549
E: MarkK@AirportNetwork.com

Odin Metrology, Inc.
Calibration of Sound & Vibration Instruments

Certificate Number: **22082-1**

Certificate of Calibration for Brüel & Kjær Pistonphone

This calibration is performed by comparison with measurement reference standard pistonphones:

Type No.	4220	4228
Serial No.	1048473	1504084
Calibrated by	TE	TE
Cal Date	17 NOV 2015	17 NOV 2015
Due Date	17 NOV 2016	17 NOV 2016

a) Estimated uncertainty of comparison: ± **0.04** dB
b) Estimated uncertainty of calibration service for standard pistonphone: ± **0.06** dB
c) Total uncertainty: $\sqrt{a^2+b^2}$ = ± **0.07** dB
d) Expanded uncertainty (coverage factor k = 2 for 95% confidence level): = ± **0.14** dB

If the ambient pressure P_a deviates from the above stated nominal value, 1,013 hPa, a correction ΔSPL should be added to the calibrated sound pressure level:

$\Delta SPL = 20*\log_{10}(P_a\ [hPa])/1013$

This acoustic calibrator has been calibrated using standards with values traceable to the National Institute of Standards and Technology. This calibration is traceable to NIST Test Number **TN-683/286992-15.**

CONDITION OF TEST		
Ambient Pressure	**995.25**	hPa
Temperature	**23**	°C
Relative Humidity	**36**	%
Date of Calibration	**18 JAN 2016**	
Re-calibration due on	**18 JAN 2018**	

The calibration of this acoustic calibrator was performed using a test system which conforms to the requirements of ANSI/NCSLZ540-1, 1994 ISO Guide 25 and the guidelines of ISO 10012-1, ISO 17025, and ISO 9001:2008, Certification NQA No. 11252.

Calibration procedure: Brüel & Kjær 4228, **21.12, 20151221.**

Calibration performed by

Harold Lynch, Service Manager

ODIN METROLOGY, INC.
3533 OLD CONEJO ROAD, SUITE 125
THOUSAND OAKS, CA 91320
PHONE: (805) 375-0830; FAX: (805) 375-0405

Calibrator type **4228**
Serial no. **2959463**
Submitted by **BridgeNet International Newport Beach, CA 92660**
Purchase order no. **Letter-K. Dunholter**
Asset no. **N/A**

This pistonphone has been found to be **within** the specifications listed below at the normalized conditions stated.

SPL produced in coupler terminated by a loading volume of 1.333 cm^3	124 ± 0.15 dB
Frequency	251.2 Hz ± 0.1%
Second Harmonic Distortion	< 3%
At 1,013 hPa, 20°C, and 65% relative humidity	

PERFORMANCE AS RECEIVED		
SPL	**124.06**	dB re 20 µPa
Frequency	**251.15**	Hz
Distortion	**1.0**	%
HF Noise	**-56**	dB re 124 dB
Battery Voltage	**8.1**	V

Was repair or adjustment performed? **No**
Were parts replaced? **No**
Were batteries replaced? **Yes**

FINAL PERFORMANCE		
SPL	**124.06**	dB re 20 µPa
Frequency	**251.15**	Hz
Distortion	**1.0**	%
HF Noise	**-56**	dB re 124 dB

Note: This pistonphone was **within** manufacturer's specifications as received.

ODIN METROLOGY, INC.

Instrumentation used for calibration of pistonphones and calibrators

Instrument Type	Type no.	Serial no.	Cal. Date	Cal. Due	Cal. by
Measuring Amplifier	2113	486832	15 JUN 15	15 JUN 16	HL
Precision Barometer	141	299/95-10	03 DEC 15	03 DEC 16	CMI
Transducer Assembly	9545	390093	03 NOV 14	03 NOV 16	TE
Pistonphone	4228	1504084	17 NOV 15	17 NOV 16	TE
Pistonphone	4220	1048473	17 NOV 15	17 NOV 16	TE
Sound Calibrator	4231	2309106	23 FEB 15	23 FEB 16	HL
Microphone	4134	1315901	08 DEC 15	08 DEC 17	TE
HP Multimeter	34401A	3146A48348	27 AUG 15	27 AUG 16	PMI
HP Multimeter	34401A	3146A74093	15 MAY 14	15 MAY 16	PMI

Calibration of reference microphones 4160 serial numbers 991820, 991821, 1054926, standard pistonphones 4220 serial numbers 1048473, 1510240, 375837, 1476021 and 4228 serial number 1793011 are calibrated traceable to NIST with NIST test number **TN-683/286992-15.**

The verification/calibration listed on page 1 of this document was performed on a test system which conforms to and operates under the requirements of **ANSI/NCSL Z540-1** which also covers the requirements for **MIL STD 45662A, ISO 17025**, and ISO 9001:2008 NQA certification no.: **11252**.

*Traceability to NIST by NIST calibration of Transfer Standard Microphone is used to verify consistency between DANAK/DPLA and NIST calibrations.

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