Enbridge
Suite 600 – 890 Winter Street
Waltham, Massachusetts 02451
USA

October 24, 2018

Mr. Thomas Cushing
Permit Section Chief
MassDEP Southeast Regional Office
20 Riverside Drive
Lakeville, MA 02347

RE: *Update to Non-Major Comprehensive Plan Approval Application*
Transmittal No. X266786
Application No. SE-15-027
Algonquin Gas Transmission, LLC – Weymouth Compressor Station

Dear Mr. Cushing:

Algonquin Gas Transmission, LLC (Algonquin) is providing an update to its Non-Major Comprehensive Plan Approval (Non-Major CPA) Application (Transmittal No. X266786) initially filed on October 23, 2015, and updated on September 9, 2016 and May 25, 2018. The application pertains to Algonquin's proposed construction of the Weymouth Compressor Station in Weymouth, MA, as a component of its Atlantic Bridge Project (Project).

The following is a description of the updates included with this letter:

- Attachment C – updated BWP AQ Sound Form based on the Supplemental Sound Level Impact Assessment report ("sound level report") submitted on October 15, 2018;

- Attachment F-2 – the sound level report for the Weymouth Compressor Station;

- Attachment H – Applicant Redline (10/24/2018) to Draft Proposed Non-Major CPA (03/30/2017)
  - Page 1 of 25 – updated professional engineer certification information to reference seal and signature on May 25, 2018 application package submittal,
  - Page 6 of 25 and 7 of 25 – updated section on "Sound Impacts and Mitigation" based on the sound level report,
  - Page 8 of 25 – updated footnote 8 for clarification on the version of modeling report,
  - Page 9 of 25 – updated Table 4 headings for clarification to read "Background plus Cumulative Impact of Weymouth Compressor Station and Regional Sources",
  - Page 10 of 25 – added sentence "The maximum modeled impacts were compared to the TELs and AALs" above Table 5,
  - Page 25 of 25 – updated Trinity cc list.

Should you have any questions regarding this updates included with this letter, please do not hesitate to contact me at 207-274-2607.

Sincerely,
ENBRIDGE

Kathryn A. Brown
Consulting Scientist

cc: Reagan Mayces, Enbridge
Barry Goodrich, Enbridge
George McLachlan, Enbridge
Ralph Child, Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C.
Robert O'Neal, Epsilon Associates
Wendy Merz, Trinity Consultants

Enclosures

Enclosure 1: Attachment C BWP AQ Sound Form

Massachusetts Department of Environmental Protection
Bureau of Waste Prevention – Air Quality

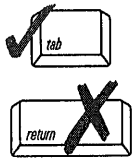
BWP AQ Sound

Submit alone and/or with Form CPA-FUEL and/or CPA-PPROCESS whenever the construction or alteration of stationary equipment (e.g. electrical generating equipment, motors, fans, process handling equipment or similar sources of sound) has the potential to cause noise, or in response to a MassDEP enforcement action citing noise as a condition of air pollution.

X266786
Transmittal Number

Facility ID (if known)

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



Introduction

When proposing sound suppression/mitigation measures, similar to the traditional "top-down" BACT process, the "top case" sound suppression/mitigation measures which deliver the lowest sound level increase above background are required to be implemented, unless these measures can be eliminated based upon technological or economic infeasibility. An applicant cannot "model out" of the use of the "top case" sound suppression/ mitigation measures by simply demonstrating that predicted sound levels at the property line when employing a less stringent sound suppression/mitigation strategy will result in a sound level increase of less than or equal to the 10 dBA (decibel, A –Weighted) above background sound level increase criteria contained in the MassDEP Noise Policy. A 10 dBA increase is the maximum increase allowed by MassDEP; it is not the sound level increase upon which the design of sound suppression/mitigation strategies and techniques should be based. Also, take into consideration that the city or town that the project is located in may have a noise ordinance (or similar) that may be more stringent than the criteria in the MassDEP Noise Policy

A. Sound Emission Sources & Abatement Equipment/Mitigation Measures

1. Provide a description of the source(s) of sound emissions and associated sound abatement equipment and/or mitigation measures. Also include details of sound emission mitigation measures to be taken during construction activities.

Significant sound sources include: 1) noise generated by the turbine/compressor located within the compressor building that radiates outside the compressor building, 2) turbine exhaust noise, 3) noise radiated from aboveground gas piping and related piping components, 4) noise of the outdoor lube oil cooler and outdoor gas cooler, 5) noise generated by the turbine air intake system. The project will use a sound suppressant muffler system for the turbine exhaust system, acoustical pipe insulation for outdoor above ground gas piping, a silencer for the turbine air intake system, a low-noise lube oil cooler for the compressor unit, an 8.5-inch concrete block building to house the gas turbine/compressor, and an 8.5-inch thick 19-foot tall courtyard barrier wall.

B. Manufacturer's Sound Emission Profiles & Sound Abatement Equipment

Please attach to this form the manufacturer's sound generation data for the equipment being proposed for installation, or the existing equipment as applicable. This data must specify the sound pressure levels for a complete 360° circumference of the equipment and at given distance from the equipment. Also attach information provided by the sound abatement manufacturer detailing the expected sound suppression to be provided by the proposed sound suppression equipment.
See Sections 6.1 to 6.6 in Sound Level Impact Assessment Report Weymouth Compressor Station, Atlantic Bridge Project, Weymouth, MA, prepared by Epsilon Associates, Inc. October 15, 2018.

C. Plot Plan

Provide a plot plan and aerial photo(s) (e.g. GIS) that defines: the specific location of the proposed or existing source(s) of sound emissions; the distances from the source(s) to the property lines; the location, distances and use of all inhabited buildings (residences, commercial, industrial, etc.) beyond the property lines; identify any areas of possible future construction beyond the property line; and sound monitoring locations used to assess noise impact on the surrounding community. All information provided in the sound survey shall contain sufficient data and detail to adequately assess any sound impacts to the surrounding community, including elevated receptors as applicable, not necessarily receptors immediately outside the facility's property line.
See Figure 5-1 (Sound Monitoring Locations), Figure 6-1 (Project Layout), Figure 6-2 (Sound Modeling Locations), Figure 6-7 (Project Layout—Mitigation Case 3) in Sound Level Impact Assessment Report Weymouth Compressor Station, Atlantic Bridge Project, Weymouth, MA, prepared by Epsilon Associates, Inc. October 15, 2018.

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D. Community Sound Level Criteria

Approval of the proposed new equipment or proposed corrective measures will **not** be granted if the installation:

1. Increases off-site broadband sound levels by more than 10 dBA.above "ambient" sound levels. Ambient is defined as the lowest one-hour background A-weighted sound pressure level that is exceeded 90 percent of the time measured during equipment operating hours. Ambient may also be established by other means with the consent of MassDEP.

2. Produces off-site a "pure tone" condition. "Pure tone" is defined as when any octave band center frequency sound pressure level exceeds the two adjacent frequency sound pressure levels by 3 decibels or more.

3. Creates a potential condition of air pollution as defined in 310 CMR 7.01 and the MassDEP Noise Policy.

Note: These criteria are measured both at the property line and at the nearest inhabited building.

For equipment that operates, or will be operated intermittently, the ambient or background noise measurements shall be performed during the hours that the equipment will operate and at the quietest times of the day. The quietest time of the day is usually between 1:00 a.m. and 4:00 a.m. on weekend nights. The nighttime sound measurements must be conducted at a time that represents the lowest ambient sound level expected during all seasons of the year.

For equipment that operates, or will operate, continuously and is a significant source of sound, such as a proposed power plant, background shall be established via a minimum of seven consecutive days of continuous monitoring at multiple locations with the dBA L 90 data and pure tone data reduced to one-hour averages.

In any case, consult with the appropriate MassDEP Regional Office before commencing noise monitoring in order to establish a sound monitoring protocol that will be acceptable to MassDEP.

E. Full Octave Band Analysis

The following community sound profiles will require the use of sound pressure level measuring equipment in the neighborhood of the installation. An ANSI S1.4 Type 1 sound monitor or equivalent shall be use for all sound measurements. A detailed description of sound monitor calibration methodology shall be included with any sound survey.

1. Lowest **ambient** sound pressure levels during operating hours of the equipment.

   a. At property line: (see Table 5-4B of Epsilon Associates, Inc. October 15, 2018 report)

A-Weighted	31.5	63.0	125	250	500	1K	2K	4K	8K	16K
(M1) 40	53	52	43	36	38	37	33	34	27	22

ND = No Data

E. Full Octave Band Analysis (continued)

b. At the nearest inhabited building and if applicable at buildings at higher elevation: (see Table 5-4B of Epsilon Associates, Inc. October 15, 2018 report)

A- Weighted	31.5	63.0	125	250	500	1K	2K	4K	8K	16K
(M2) 36	50	49	41	36	34	30	25	28	21	23
(M3) 45	54	55	59	42	38	37	34	36	24	23
(M4) 37	51	52	43	39	33	31	28	34	20	23
(M5) 34	50	51	44	35	31	28	23	22	18	22
(M6) 41	50	51	46	40	40	38	33	31	20	24

Note: You are required to complete sound profiles 2a and 2b only if you are submitting this form in response to a MassDEP enforcement action citing a noise nuisance condition. If this is an application for new equipment, Skip to 3.

2. Neighborhood sound pressure levels with source operating without sound abatement equipment.

a. At property line:

A- Weighted	31.5	63.0	125	250	500	1K	2K	4K	8K	16K

b. At the nearest inhabited building and if applicable at buildings at higher elevation:

A- Weighted	31.5	63.0	125	250	500	1K	2K	4K	8K	16K

NA = Not Applicable

Continue to Next Page ▶

E. Full Octave Band Analysis (continued)

3. **Expected** neighborhood sound pressure levels after installation of sound abatement equipment.

a. At property line: (see Table 6-8B of Epsilon Associates, Inc. October 15, 2018 report)

A- Weighted	31.5	63.0	125	250	500	1K	2K	4K	8K	16K
(A) 47	75	67	54	46	44	41	37	36	29	27

b. At nearest inhabited building and if applicable at buildings at higher elevations:

A- Weighted	31.5	63.0	125	250	500	1K	2K	4K	8K	16K
(B) 44	62	55	49	40	37	40	38	33	21	23
(C) 46	58	56	59[2]	43	39	40	37	36	24	23
(D) 38	56	53	44	39	34	32	29	34[1]	20	23
(E) 37	54	52	45	36	32	33	30	23	18	22
(F) 42	55	53	47	40	40	39	35	31	20	24
(G) 43	56	53	48	40	40	40	36	31	20	24

Note: MassDEP may request that actual measurements be taken after the installation of the noise abatement equipment to verify compliance at all off-site locations.

[1] -- MassDEP-defined pure tone attributable to the existing ambient sound levels, not the Project

F. Professional Engineers Stamp

The seal or stamp and signature of a Massachusetts Registered Professional Engineer (P.E.) must be entered below. Both the seal or stamp impression and the P.E. signature must be original. This is to certify that the information contained in this Form has been checked for accuracy, and that the design represents good air pollution control engineering practice.

Dale T. Raczynski
P.E. Name (Type or Print)

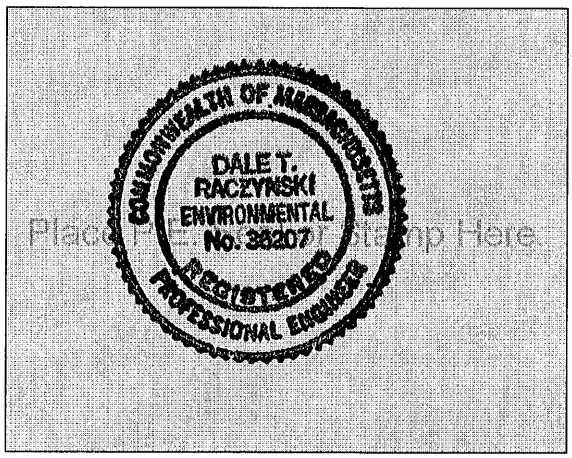
P.E. Signature

Principal
Position/Title

Epsilon Associates, Inc.
Company

10/15/2018
Date (MM/DD/YYYY)

36207
P.E. Number



BWP AQ Sound

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G. Certification by Responsible Official

The signature below provides the affirmative demonstration pursuant to 310 CMR 7.02(5)(c)8 that any facility(ies) in Massachusetts, owned or operated by the proponent for this project (or by an entity controlling, controlled by or under common control with such proponent) that is subject to 310 CMR 7.00, et seq., is in compliance with, or on a MassDEP approved compliance schedule to meet, all provisions of 310 CMR 7.00, et seq., and any plan approval, order, notice of noncompliance or permit issued thereunder. This Form must be signed by a Responsible Official working at the location of the proposed new or modified facility. Even if an agent has been designated to fill out this Form, the Responsible Official must sign it. (Refer to the definition given in 310 CMR 7.00.)

I certify that I have personally examined the foregoing and am familiar with the information contained in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including possible fines and imprisonment.

Michael Koby
Responsible Official Name (Type or Print)

Responsible Official Signature

VP – Safety & Reliability
Responsible Official Title

Enbridge Inc.
Responsible Official Company/Organization Name

10/15/2018
Date (MM/DD/YYYY)

Enclosure 2: Attachment F-2 Sound Level Report

SOUND LEVEL IMPACT ASSESSMENT REPORT

Weymouth Compressor Station
Atlantic Bridge Project
Weymouth, Massachusetts

Prepared for:

Algonquin Gas Transmission, LLC
890 Winter Street, Suite 300
Waltham, MA 02451

Prepared by:

Epsilon Associates, Inc.
3 Mill & Main Place, Suite 250
Maynard, MA 01754

October 15, 2018

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Executive Summary

1.0 EXECUTIVE SUMMARY

Algonquin Gas Transmission, LLC is proposing to install a natural gas compressor station known as the Weymouth Compressor Station ("Station"). A detailed sound level impact assessment was prepared to evaluate potential noise from the Station. Existing condition sound levels were measured around the site, an operational sound level modeling analysis was conducted for the notable Station equipment, and additional noise controls are discussed in the Best Available Noise Control Technology analysis.

Existing condition sound level measurements were measured for eight days at six locations around the site in accordance with a Massachusetts Department of Environmental Protection approved protocol. During the program, the sound level monitoring equipment malfunctioned at two of the six locations, and thus no data were collected at those two locations, and no ambient sound level could be established. Both malfunctions were attributable to hardware issues that are being evaluated by the equipment manufacturer. To complete the ambient dataset, a second monitoring program was conducted at all six locations for another eight days. The lowest sound level measured during either program was conservatively used to establish background at each location.

Sound level modeling was conducted for a "Base Case" scenario. The "Base Case" included approximately $5.57 Million of noise controls on the equipment including:

- Gas turbine air intake – 5-foot silencer; air intake filter
- Gas turbine exhaust – 2-stage silencer
- Gas turbine and compressor – 22-gauge metal building; 6-inch insulation; insulated roll-up door; no windows
- Gas turbine compressor building air intake fans – 3-foot silencers
- Aboveground piping – Acoustical pipe insulation; courtyard barrier wall (8.5-inch concrete)
- Gas cooler – courtyard barrier wall (8.5-inch concrete)

Three additional rounds of noise control evaluation were conducted as part of the Best Available Noise Control Technology analysis. As a result of these analyses, the following additional noise controls were evaluated and are proposed for this Station at an incremental cost of approximately $865,000:

- Lube oil cooler – quieter equipment; relocate behind courtyard barrier wall (8.5-inch concrete)
- Gas turbine compressor building air intake fans – 5-foot silencers (replaces 3-foot silencers)
- Additional compressor building roll-up door

- Replacing the metal-skinned gas compressor building with an 8.5-inch thick concrete block building

- Better silencing features for the turbine intake and exhaust

The net result of the study is that substantial noise mitigation measures totaling more than $6.4 Million dollars have been incorporated into the design of the proposed Project to minimize noise impacts in the community. Results of a complete sound level assessment demonstrate that noise levels from the Project will comply with the requirements set forth in the MassDEP Noise Policy, and have been provided with the best available noise controls.

Section 2.0

Introduction

2.0 INTRODUCTION

Algonquin Gas Transmission, LLC (AGT) is proposing to install a natural gas compressor station known as the Weymouth Compressor Station ("Station"). This Station is associated with the Atlantic Bridge Project for AGT. The Station will be located in Norfolk County, Massachusetts, within the limits of the Town of Weymouth (MA), on the north side of Bridge Street just east of the Fore River Bridge. There is an existing AGT natural gas metering and regulating station (*i.e.*, "Weymouth M&R Station"), and the Massachusetts Water Resource Authority (MWRA) Intermediate Pumping Station located in the same general area as the Station site. The Station will be equipped with one (1) Solar Taurus 60 turbine-driven compressor unit [ISO horsepower (HP) of 7,700 HP]. The turbine and compressor will be installed in an acoustically-insulated building ("compressor building"), which will be constructed with a brick façade.

The following describes the auxiliary equipment and other notable items associated with the Station.

- Turbine exhaust system, which includes a silencer system and exhaust stack;
- Turbine air intake filter system that includes a silencer system;
- Outdoor lube oil cooler ("LO cooler") that serves the compressor unit;
- Aboveground gas piping and associated components (*e.g.*, valves, suction filter separators);
- Outdoor gas cooler that serves the Station compressor unit; and
- Courtyard barrier/walls between the compressor building and auxiliary building; as a result, the gas cooler and a portion of the aboveground piping in the area of the compressor building will be located inside a "courtyard area".

This report provides a description of the applicable federal, state, and local noise regulatory requirements, a brief explanation of noise terminology, a summary of the results of a complete ambient sound level monitoring program, and a discussion of the sound level modeling analysis for the proposed Station. Additional noise control options are discussed in the Best Available Noise Control Technology analysis. AGT's design of the proposed Project incorporates more than $6.4 Million of noise reduction measures. Operation of the Station will comply with the MassDEP noise requirements at all locations.

Section 3.0

Regulatory Requirements

3.0 REGULATORY REQUIREMENTS

3.1 Federal Noise Guidelines

The Environmental Protection Agency (EPA) identifies safe levels of environmental noise exposure in a document intended to "provide State and Local governments as well as the Federal Government and the private sector with an informational point of departure for the purpose of decision making."[1] While the EPA has no regulation governing environmental noise, the agency has conducted several extensive studies to identify the effects of sound level on public health and welfare. This publication remains the authoritative study based on a large sampling of community reaction to noise. The EPA sound level guidelines do not provide an absolute measure of noise impact, but rather a consensus on potential activity interference, human health and welfare effects, and annoyance. Since these protective levels were derived without concern for technical or economic feasibility, and contain a margin of safety to ensure their protective value, they should not be viewed as standards, criteria, regulations, or goals. Rather, EPA has stated that they should be viewed as levels below which the general population will not be at risk from the effects of noise.[2]

The EPA recommends that sound levels outdoors in *residential* areas, and in other places in which quiet is a basis for use, not exceed a day-night sound level (L_{dn}) of 55 dBA in order to "protect the public health and welfare with an adequate margin of safety," the standard set out in the Noise Control Act of 1972.[3] This level (55 dBA L_{dn}) is also the limit required at noise sensitive areas by the Office of Energy Projects of the Federal Energy Regulatory Commission (FERC) from a natural gas compressor station. The EPA also suggests an L_{eq} of 70 dBA (24-hour) limit to avoid adverse effects on public health and safety at publicly accessible property lines or extents of work areas where extended public exposure is possible.[4] These levels are identified as desirable to protect against speech interference and sleep disturbance for residential, educational, and healthcare areas.

3.2 Massachusetts State Regulations

The Massachusetts Department of Environmental Protection (MassDEP) regulates noise under its Air Pollution Control regulations. In these regulations, an "air contaminant" is defined to include sound, and a condition of "air pollution" includes the presence of an air contaminant in such concentration and duration as to "cause a nuisance" or "unreasonably interfere with the comfortable enjoyment of life and property." (310 CMR 7.00)

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1 U.S. EPA, *Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety*, Document EPA-550/9-74-004, March, 1974. ("Document EPA-550/9-74-004")

2 Document EPA-550/9-74-004, at 4.

3 *Id.*, Noise Control Act of 1972, 42 USC 4904(a)(2).

4 That is, to protect against hearing damage, one's 24-hour noise exposure should not exceed 70 dBA.

MassDEP's regulations at 310 CMR 7.10 prohibit "unnecessary emissions" of noise. MassDEP Division of Air Quality Control ("DAQC") Policy Statement 90-001 (February 1, 1990) (the "MassDEP Noise Policy") interprets a violation of this noise regulation to have occurred if the source causes either:

1) An increase in the broadband sound pressure level of more than 10 dBA above the ambient, or

2) A "pure tone" condition.

"Ambient" is defined as the background A-weighted sound level that is exceeded 90% of the time, measured during equipment operating hours (L_{90}). A "pure tone" condition occurs when any octave band sound pressure level exceeds both of the two adjacent octave band sound pressure levels by 3 dB or more.

These noise limits are MassDEP policy and are applicable both at the Property line and at the nearest residences. As a policy and not regulation, the MassDEP has waived these limits in certain cases at property line locations where the adjacent land uses are not considered noise sensitive, such as an adjacent industrial parcel.

3.3 Local Noise Regulations

The Town of Weymouth, Code of Ordinances, Chapter 11, Section 11-101(b)(4) identifies a nuisance as a condition when "noise is over 10 dB over ambient background." This is similar to the MassDEP policy.

Section 4.0

General Environmental Noise Metrics

4.0 GENERAL ENVIRONMENTAL NOISE METRICS

The unit of sound pressure is the decibel ("dB"). The decibel scale is logarithmic to accommodate the large dynamics of sound intensities to which the human ear is subjected. By definition, the decibel corresponds to a logarithmic scale formed by taking 20 times the logarithm (base 10) of the ratio of two sound pressures (L_P): the measured sound pressure divided by a reference sound pressure. The reference sound pressure is 20 dB re μPa (0 dB), the approximate threshold of human perception of sound at a frequency of 1000 Hz. The loudness of a sound source is typically reported by equipment manufacturers as the source sound power level (L_W), or the total acoustic power radiated in decibels referenced to 10^{-12} watts. Sound power ratings are independent of environmental conditions in comparison to received sound pressure levels, which include the effects of propagation and attenuation that occur between the source and receptor.

An inherent property of the logarithmic decibel scale is that the sound pressure levels of two separate sounds are not directly additive. For example, if a sound of 50 dB is added to another sound of 50 dB, the total is a three-decibel increase (or 53 dB), not an arithmetic doubling to 100 dB. The human ear does not perceive changes in the sound pressure level as equal changes in loudness. Scientific research demonstrates that the following general relationships hold between sound level and human perception for two sound levels with the same or very similar frequency characteristics:

1 dBA is the practically achievable limit of the accuracy of sound measurement systems and corresponds to an approximate 10% variation in sound pressure. A 1 dBA increase or decrease is a non-perceptible change in sound.

3 dBA increase or decrease is a doubling (or halving) of acoustic energy and it corresponds to the threshold of perceptibility of change. In practice, a 3 dBA change in environmental sound is just perceptible to the average person.[5]

5 dBA increase or decrease is described as a perceptible change in sound level and is a discernible change in an outdoor environment.

10 dBA increase or decrease is a tenfold increase or decrease in acoustic energy, but is perceived as a doubling or halving in sound (*i.e.*, the average person will judge a 10 dBA change in sound level to be twice or half as loud).[6]

Environmental sound is typically composed of acoustic energy across a wide range of frequencies, referred to as the frequency spectra; however, the human ear does not interpret

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[5] 2009 ASHRAE Handbook – Fundamentals, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., Atlanta, GA, 2009.

[6] Procedures for the Computation of Loudness of Steady Sounds, American National Standard, ANSI S3.4-2007, Annex A, NY.

the sound level from each frequency as equally loud. To compensate for the physical response of the human ear, the A-weighting filter is commonly used for describing environmental sound levels. The A-weighting filters the frequency spectrum of sound levels to correspond to the frequency response of the human ear (attenuating low and high frequency energy similar to the way people hear sound). Sound levels that are A-weighted to reflect human response are presented as "dBA." The A-weighted sound level is the most widely accepted descriptor for community noise assessments. Unweighted sound levels are referred to as linear decibels, and given in units of "dB" or "dBL."

Sound levels can be measured and presented in various formats. The most common sound metric used in community sound surveys is the equivalent sound level (L_{eq}). The L_{eq} level is the energy averaged, A-weighted sound pressure level that occurs over a given time period, *i.e.*, the steady, continuous sound level which has the same acoustic energy as the time-varying sound levels over the same time period. The L_{eq} has been shown to provide both an effective and uniform method for comparing time-varying sound levels and is routinely employed. Community sound levels are also often described in terms of the "day-night" averaged sound level (L_{dn}), which accounts for the increased potential for annoyance that comes with elevated sound levels at night. Specifically, a 10 dBA "penalty" is added to all sound levels from 10 PM to 7 AM, and the L_{dn} is calculated from 24 hours of sound level data. In addition, the maximum sound level (L_{max}) can be used to quantify the maximum instantaneous sound pressure level generated by a source. Statistical levels help further characterize the sound environment. The percentile sound levels ($L_{\%}$) indicate the sound level exceeded for that percentage of the measurement period. The L_{90} level is commonly referred to as the residual sound level as it excludes short-term intrusive noise events so it is effective in defining the quietest periods. The L_{90} is the statistical level that is the level exceeded during 90% of the measurement period, and is the metric used by MassDEP to define "ambient." In comparison, the L_{10} is referred to as the intrusive level and is the sound level that is exceeded for 10% of the time during the measurement.

The noise metrics defined are broadband, *i.e.*, inclusive of sound across the entire audible frequency spectrum. In addition to broadband, sound level data typically includes an analysis of the various frequency components of the sound spectrum to determine the potential for tonal characteristics and for use in identifying candidate noise mitigation measures. The unit of frequency is Hertz ("Hz"), measuring the cycles per second of the sound pressure waves, and typically the frequency analysis is stated in terms of octave- or one-third-octave-band sound-pressure levels, in dB, with the octave frequency bands being those established by standard (American National Standards Institute (ANSI) S1.11, 1986). In this analysis, octave-band sound levels were used primarily for purposes of evaluating the "pure tone" component of the MassDEP Noise Policy.

Measured sound levels may be influenced by seasonal sound sources, *i.e.*, insects in the summertime. During some periods of the year, sound from insects, birds, and leaf rustle will not be present (*e.g.*, winter) and the ambient sound levels will be lower than during the

summertime. Therefore, to more closely replicate sound levels observed at the same monitoring locations during these periods ("quiet seasons"), a high-frequency natural sound (HFNS) filter may be applied to the measured spectral data from which a new broadband sound level may be calculated to account for seasonal variation. This technique removes all sound energy above the 1250 Hertz frequency one-third octave band. The methodology for the filtration process is specified in ANSI/ASA S12.100-2014. Sound pressure levels calculated with this methodology are indicated as ANS-weighted levels (presented in dBA).

Estimations of common noise sources and outdoor acoustic environments, and the comparison of relative loudness are presented in Table 4-1.

Table 4-1 Sound Pressure Levels and Relative Loudness of Common Noise Sources and Soundscapes

Noise Source or Activity	Sound Level (dBA)	Subjective Impression	Relative Loudness (perception of different sound levels)
Jet aircraft takeoff from carrier (50 feet)	140	Threshold of pain	64 times as loud
50-hp siren (100 feet)	130		32 times as loud
Loud rock concert near stage Jet takeoff (200 feet)	120	Uncomfortably loud	16 times as loud
Float plane takeoff (100 feet)	110		8 times as loud
Jet takeoff (2,000 feet)	100	Very loud	4 times as loud
Heavy truck or motorcycle (25 feet)	90		2 times as loud
Garbage disposal Food blender (2 feet) Pneumatic drill (50 feet)	80	Loud	Reference loudness
Vacuum cleaner (10 feet)	70	Moderate	1/2 as loud
Passenger car at 65 mph (25 feet)	65		
Large store air-conditioning unit (20 feet)	60		1/4 as loud
Light auto traffic (100 feet)	50	Quiet	1/8 as loud
Quiet suburban area	45		
Bedroom or quiet living room Bird calls	40	Faint	1/16 as loud
Typical wilderness area	35		
Quiet library, soft whisper (15 feet)	30	Very quiet	1/32 as loud
Wilderness with no wind or animal activity	25	Extremely quiet	
High-quality recording studio	20		1/64 as loud
Acoustic test chamber	10	Just audible	
	0	Threshold of hearing	

Section 5.0

Existing Sound Levels

5.0 EXISTING SOUND LEVELS

5.1 Sound Level Measurement Methodology

Pursuant to a Protocol[7] submitted June 26, 2018, with comments from the MassDEP received August 3, 2018, a comprehensive background measurement program consisting of six long-term continuous sound level monitoring stations was developed to:

1. Establish representative A-weighted broadband ambient sound pressure levels, for evaluating compliance with the MassDEP policy limit of a 10 dBA increase due to the proposed Project; and

2. Establish representative octave-band ambient sound pressure levels to identify any existing "pure tones," as defined by MassDEP, and evaluate whether the addition of modeled sound levels from the proposed Project to these background sound levels may introduce or exacerbate existing "pure tones" in the community.

The MassDEP-reviewed Protocol is included in this report as Appendix A. The MassDEP comments on the attached Protocol were that the DEP should be consulted before anomalous data were excluded from the analysis. Only measurement periods during, or affected by, precipitation were excluded from the analysis. This approach is consistent with the ANSI Standard S12.18-1994 (R2009). MassDEP's comments were provided in email format and are included at the end of Appendix A.

Continuous A-weighted and octave-band measurements (24 hours/day) were made concurrently at six locations over approximately a one-week period from Thursday, September 13, 2018 through Friday, September 21, 2018. The long-term monitors were generally unattended[8], with personal observations made by a field technician during deployment, a nighttime site visit, and demobilization. During the program, the sound level monitoring equipment malfunctioned at two of the six locations, and thus no data were collected at those two locations and no ambient sound level could be established. Both malfunctions were attributable to hardware issues that are being evaluated by the equipment manufacturer. To complete the ambient dataset, a second monitoring program was conducted at all six locations starting Thursday, September 27, 2018 and completed on Friday, October 5, 2018. The monitors[9] were generally unattended[10], with personal

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7 Epsilon Associates, Inc., Sound Level Measurement Protocol, June 26, 2018.

8 Though the equipment was left unattended, security detail was in place for nighttime hours during the entire program to check that the equipment was secure and that no tampering of the equipment occurred.

9 The instrumentation that malfunctioned during the first measurement program was not utilized during the second program.

observations made by a field technician during deployment, a nighttime site visit, and demobilization. Equipment integrity checks were performed on five occasions during the second program to ensure proper operation of the instrumentation, and a data download was also performed during the interim. Meteorological data were collected onsite and archived from the Boston Logan International Airport National Weather Service (NWS)[11] station provided by the National Centers for Environmental Information (NCEI) for the duration of both measurement programs. All sound level data and meteorological data collected during the programs are included in the ambient analysis and presented in this report.

5.2 Sound Level Measurement Locations

Six sound level measurement locations were selected to represent sound levels at the nearest noise sensitive receptors to the Project, including residences in all relevant directions from the Project and the walking path in the King's Cove conservation area to the immediate east of the Project property line. All measurements were made at publicly accessible locations and/or with landowner permission.

These six background sound level monitoring sites, described below, were selected to establish a current ambient sound pressure level for noise sensitive areas in the vicinity of the Project.

- **Location M1** - King's Cove Property Line (PL) - was selected to represent sound levels at the closest property line immediately east of the Project. This location is approximately 90 feet east of the center of the compressor building. This location also represents existing sound levels along the walking path that goes through the public park located in the Fore River Basin south of the MWRA pumping station within the King's Cove conservation area.

- **Location M2** - Bridge Street - was selected to represent sound levels at the nearest residences to the southeast. This location is at a Town-owned parcel at 116 Bridge Street, approximately 840 feet from the center of the compressor building.

- **Location M3** - Monatiquot Street - was selected to represent sound levels at the nearest residences to the south, which are set back from Bridge Street traffic. M3 was located just within the Fore River Energy Center fence line near the intersection of Monatiquot Street and Bluff Road. This location is approximately 1,300 feet from the center of the compressor building.

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[10] Though the equipment was left unattended, security detail was in place during the full week to check that the equipment was secure and that no tampering of the equipment occurred.

[11] Logan International Airport NWS data are provided as Appendix D

- **Location M4** - King's Cove Beach Road (KCBR) - was selected to represent sound levels at the nearest residences to the east along King's Cove Beach Road (KCBR). This location is at 73 KCBR and approximately 1,530 feet from the center of the compressor building.

- **Location M5** - City of Quincy Park - was selected to represent sound levels at the nearest residences to the west. This location is in Quincy at a City-owned parcel along Washington Street approximately 2,850 feet from the center of the compressor building.

- **Location M6** - O'Brien Towers - was selected to represent sound levels at the nearest group of residences to the north. The location is in Quincy on the south lawn of the O'Brien Towers south of Bicknell Street. This location is approximately 1,740 feet from the center of the compressor building.

An aerial photograph of the Project site is shown in Figure 5-1, identifying the Property boundary, nearby roads, property parcels, and background monitoring locations. The coordinates listed in Table 5-1 for the sound level measurement locations were obtained from a close review of aerial imagery by the field technician.

Table 5-1 GPS Coordinates – Sound Level Monitoring Locations

Location ID	Description	Massachusetts State Plane Meters (NAD83)	
		X (meters)	Y (meters)
M1	King's Cove Property Line (PL)	244359.40	888390.82
M2	Bridge Street	244489.85	888193.66
M3	Monatiquot Street	244287.14	888000.38
M4	King's Cove Beach Road (KCBR)	244794.57	888455.28
M5	City of Quincy Park	243477.10	888540.14
M6	O'Brien Towers	244232.98	888916.71

Weymouth Compressor Station Weymouth, Massachusetts

Epsilon Associates Inc.

Figure 5-1

Sound Level Measurement Locations

5.3 Sound Level and Meteorological Measurement Equipment

Six Larson Davis (LD) Model 831 integrating sound level meters, tripod-mounted at a height of approximately five feet (1.5 meters) above ground level and fitted with the manufacturer's environmental windscreen, were used to collect background sound pressure level data during each program. Each meter, connected to a microphone via an extension cable and housed in an environmental suitcase, was programmed to log statistical A-weighted broadband and unweighted octave-band sound level data (L_1, L_{10}, L_{50}, L_{90}, L_{max}, and L_{eq}) over one-hour intervals with a one-second time history.

All sound monitoring instrumentation met the "Type 1 - Precision" requirements set forth in ANSI S1.4-1983 as specified in the ANSI S12.18-1994 methodology as well as those in ANSI S1.11-2004 (octave filter standard) for acoustical measuring devices.

The measurement equipment was calibrated in the field before and after the surveys with the manufacturer's acoustical calibrator (CAL200), which meets the standards of IEC 942 Class 1L and ANSI S1.40-1984. All calibrations were within 0.5 dB from the most recent calibration. The meters were calibrated and certified as accurate to standards set by the National Institute of Standards and Technology by an independent laboratory within the prior 12 months. Calibration certificates are provided in Appendix C.

Continuous hourly wind speed, wind direction, temperature, and precipitation measurements were made at the King's Cove PL location (M1) using a 2-meter ATMOS 41 weather station and EM60 data logger manufactured by Meter Group, Inc. The sensors were mounted at a height of approximately 2 meters above ground level and data were logged every hour. The weather station has a wind speed measurement range of 0 to 30 m/s (67 mph) and an accuracy of $\pm$0.3 m/s (0.67 mph). The wind direction measurement range is 0 to 359 degrees with an accuracy of $\pm$5 degrees. The air temperature measurement range is -50 to 60°C (-58 to 140°F) with an accuracy of $\pm$1.0°C, and the precipitation measurement range is 0 to 400 mm/h with an accuracy of $\pm$5% of the measurement from 0 to 50 mm/h.

5.4 Sound Level Measurement Results

Current noise sources in the area surrounding the proposed Project area include: vehicle traffic along Route 3A (primarily over Fore River Bridge) as well as local roads; aircraft flyovers; mechanical noise from the Twin Rivers Technologies facility; mechanical noise from the MWRA facility; mechanical noise from the Calpine Fore River Energy Center; residential air conditioning units; insect noise; rustling vegetation; water on the shore; occasional wind; and birds. During the 9/13 to 9/21/18 sound level measurement program, the Calpine Fore River Energy Center was operational until midnight 9/20. During the 9/27-10/5/18 sound level measurement program, the same power plant was offline.

Hourly A-weighted broadband sound pressure level data from the continuous ambient monitoring stations at locations M1 through M6 are presented in Appendix B. Sound level measurement data from both monitoring programs are shown and included in the analysis. Periods of precipitation totaling approximately 88 hours as recorded by the ATMOS weather station were excluded from the dataset. These included some very brief gaps in the precipitation event which were excluded due to potential elevations in ambient sound levels. These precipitation periods are shown in Appendix B. Ground level wind speeds greater than 5 m/s (11 mph) were not observed during the sound level measurement program by the ATMOS station, as is evident in Appendix B. Due to zero periods reaching this threshold, there were no periods removed from the dataset due to wind speed levels.

As the ambient measurements were conducted during a time of year when insects and leaf rustle were present, the measured L_{90} sound levels were ANS-weighted to represent a quiet period of the year. The ANS L_{90} sound levels are presented in this report and conservatively used in the compliance evaluation for the Project.

For the period, September 13 - 21, 2018, daytime (7AM - 10PM) ANS-weighted L_{90} sound levels at the King's Cove PL location (M1) ranged from 46 to 56 dBA. Daytime ANS-weighted L_{90} sound levels ranged from 44 to 54 dBA at the Monatiquot Street location (M3), from 46 to 66 dBA at the Quincy Park location (M5), and from 45 to 58 dBA at the O'Brien Towers location (M6). The lowest daytime ambient broadband L_{90} sound level for each measurement location is presented in Table 5-2A along with the L_{90} octave-band sound levels measured during the same timestamp. No data were available at the Bridge Street location (M2) or the King's Cove Beach Road location (M4) due to the sound measurement equipment malfunctions.

For the period, September 13 - 21, 2018, nighttime (10PM – 7AM) ANS-weighted L_{90} sound levels at the King's Cove PL location (M1) ranged from 44 to 54 dBA. Nighttime ANS-weighted L_{90} sound levels ranged from 45 to 51 dBA at the Monatiquot Street location (M3), from 37 to 55 dBA at the Quincy Park location (M5), and from 43 to 51 dBA at the O'Brien Towers location (M6). The lowest nighttime ambient broadband L_{90} sound level for each measurement location is presented in Table 5-2B along with the L_{90} octave-band sound levels measured during the same timestamp. No data were available at the Bridge Street location (M2) or the King's Cove Beach Road location (M4) due to the sound measurement equipment malfunctions.

For the period, September 27 - October 5, 2018, daytime (7AM - 10PM) ANS-weighted L_{90} sound levels at the King's Cove PL location (M1) ranged from 44 to 57 dBA. Daytime ANS-weighted L_{90} sound levels ranged from 48 to 60 dBA at the Bridge Street location (M2), from 45 to 59 dBA at the Monatiquot Street location (M3), from 40 to 53 dBA at the King's Cove Beach Road location (M4), from 45 to 57 dBA at the Quincy Park location (M5), and from 42 to 56 dBA at the O'Brien Towers location (M6). The lowest daytime ambient broadband L_{90} sound level for each measurement location is presented in Table 5-3A along with the L_{90} octave-band sound levels measured during the same timestamp.

For the period, September 27 - October 5, 2018, nighttime (10PM – 7AM) ANS-weighted L_{90} sound levels at the King's Cove PL location (M1) ranged from 40 to 56 dBA. Nighttime ANS-weighted L_{90} sound levels ranged from 36 to 57 dBA at the Bridge Street location (M2), from 45 to 49 dBA at the Monatiquot Street location (M3), from 37 to 51 dBA at the King's Cove Beach Road location (M4), from 34 to 61 dBA at the Quincy Park location (M5), and from 41 to 51 dBA at the O'Brien Towers location (M6). The lowest nighttime ambient broadband L_{90} sound level for each measurement location is presented in Table 5-3B along with the L_{90} octave-band sound levels measured during the same timestamp.

The lowest ANS-weighted L_{90} (1-hour) sound levels ranged from 40 to 48 dBA during the day and from 34 to 45 dBA at night across the six locations during all monitoring periods.

Table 5-2A Lowest Daytime[1] Ambient L_{90} Sound Level Measurement Summary—9/13 to 9/21/18

Monitoring Location ID	Date/Start Time of Lowest Daytime L_{90}	ANS-Weighted L_{90}[2]	Measured L_{90}[3] Sound Pressure Level (dB) by Octave Band (Hz)									
			31.5	63	125	250	500	1k	2k	4k	8k	16k
		dBA	dB	dB	dB	dB	dB	dB	dB	dB	dB	dB
M1	9/15 8:00 PM	46	65	61	51	43	44	41	51[4]	43	33	23
M2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M3	9/21 9:00 AM	44	59	58	57	42	39	37	34	31	28	23
M4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M5	9/16 7:00 AM	46	65	57	52	44	40	44[4]	39	29	21	24
M6	9/19 9:00 PM	45	63	55	49	42	42	43	40	36	27	25

1. 'Daytime' defined to be between the hours of 7AM and 10PM.
2. Broadband ANS-weighted L_{90} (dBA) is the lowest such level observed during daytime hours.
3. Octave-band values correspond to the hourly period when the lowest ANS-weighted L_{90} sound level was observed.
4. MassDEP-defined pure tone in ambient sound level data.
5. 'ND' indicates no data.

Table 5-2B Lowest Nighttime[1] Ambient L_{90} Sound Level Measurement Summary—9/13 to 9/21/18

Monitoring Location ID	Date/Start Time of Lowest Nighttime L_{90}	ANS-Weighted L_{90}[2]	Measured L_{90}[3] Sound Pressure Level (dB) by Octave-Band (Hz)									
			31.5	63	125	250	500	1k	2k	4k	8k	16k
		dBA	dB	dB	dB	dB	dB	dB	dB	dB	dB	dB
M1	9/17 3:00 AM	44	64	58	46	40	42	40	39	48[4]	44	28
M2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M3	9/21 2:00 AM	45	54	55	59[4]	42	38	37	34	36	24	23
M4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M5	9/14 2:00 AM	37	65	51	45	36	33	31	26	35[4]	20	24
M6	9/20 2:00 AM	43	55	55	48	40	40	41	39	36	25	24

1. 'Nighttime' defined to be between the operational hours of 10PM and 7AM.
2. Broadband ANS-weighted L_{90} (dBA) is the lowest such level observed during daytime hours.
3. Octave-band values correspond to the hourly period when the lowest ANS-weighted L_{90} sound level was observed.
4. MassDEP-defined pure tone in ambient sound level data
5. 'ND' indicates no data

Table 5-3A Lowest Daytime[1] Ambient L_{90} Sound Level Measurement Summary—9/27 to 10/5/18

Monitoring Location ID	Date/Start Time of Lowest Daytime L_{90}	ANS-Weighted L_{90}[2]	Measured L_{90}[3] Sound Pressure Level (dB) by Octave Band (Hz)									
			31.5	63	125	250	500	1k	2k	4k	8k	16k
		dBA	dB	dB	dB	dB	dB	dB	dB	dB	dB	dB
M1	9/30 5:00 PM	44	58	58	49	40	43	41	37	36	25	22
M2	9/30 9:00 PM	48	57	56	52	46	44	46	41	32	24	23
M3	9/28 8:00 PM	45	58	58	52	43	40	41	38	38	22	22
M4	10/1 1:00 PM	40	54	55	49	40	35	36	33	30	24	23
M5	9/30 7:00 AM	45	55	54	49	41	40	42	37	26	19	22
M6	10/3 8:00 PM	42	55	54	48	41	39	39	37	33	22	30

1. 'Daytime' defined to be between the hours of 7AM and 10PM.
2. Broadband ANS-weighted L_{90} (dBA) is the lowest such level observed during daytime hours.
3. Octave-band values correspond to the hourly period when the lowest ANS-weighted L_{90} sound level was observed.

Table 5-3B Lowest Nighttime[1] Ambient L_{90} Sound Level Measurement Summary—9/27 to 10/5/18

Monitoring Location ID	Date/Start Time of Lowest Nighttime L_{90}	ANS-Weighted L_{90}[2]	Measured L_{90}[3] Sound Pressure Level (dB) by Octave-Band (Hz)									
			31.5	63	125	250	500	1k	2k	4k	8k	16k
		dBA	dB	dB	dB	dB	dB	dB	dB	dB	dB	dB
M1	10/1 2:00 AM	40	53	52	43	36	38	37	33	34	27	22
M2	10/4 1:00 AM	36	50	49	41	36	34	30	25	28[4]	21	23
M3	9/28 2:00 AM	45	57	57	58	41	37	37	36	45[4]	27	22
M4	9/28 2:00 AM	37	51	52	43	39	33	31	28	34[4]	20	23
M5	9/30 3:00 AM	34	50	51	44	35	31	28	23	22	18	22
M6	10/1 2:00 AM	41	50	51	46	40	40	38	33	31	20	24

1. 'Nighttime' defined to be between the operational hours of 10PM and 7AM.
2. Broadband ANS-weighted L_{90} (dBA) is the lowest such level observed during daytime hours.
3. Octave-band values correspond to the hourly period when the lowest ANS-weighted L_{90} sound level was observed.
4. MassDEP-defined pure tone in ambient sound level data

5.5 Establishment of Background for MassDEP

Based on the data presented in this report, daytime and nighttime ambient L_{90} background sound levels for each of the six measurement locations have been established as listed in Tables 5-4A and 5-4B. These utilize the lowest L_{90} values from both measurement programs combined.

Table 5-4A Summary of Lowest Daytime[1] Ambient L_{90} Sound Levels

Mon. Loc. ID	Description	ANS-Weighted L90[2]	Measured L_{90}[3] Sound Pressure Level (dB) by Octave-Band (Hz)									
			31.5	63	125	250	500	1k	2k	4k	8k	16k
		dBA	dB	dB	dB	dB	dB	dB	dB	dB	dB	dB
M1	King's Cove PL	44	58	58	49	40	43	41	37	36	25	22
M2	Bridge St.	48	57	56	52	46	44	46	41	32	24	23
M3	Monatiquot St.	44	59	58	57	42	39	37	34	31	28	23
M4	KCBR	40	54	55	49	40	35	36	33	30	24	23
M5	Quincy Park	45	55	54	49	41	40	42	37	26	19	22
M6	O'Brien Towers	42	55	54	48	41	39	39	37	33	22	30

1. 'Daytime' defined to be between the hours of 7AM and 10PM.
2. Broadband ANS-weighted L_{90} (dBA) is the lowest such level observed during daytime hours.
3. Octave-band values correspond to the hourly period when the lowest ANS-weighted L_{90} sound level was observed.

Table 5-4B Summary of Lowest Nighttime[1] Ambient L_{90} Sound Levels

Mon. Loc. ID	Description	ANS-Weighted L90[2]	Measured L_{90}[3] Sound Pressure Level (dB) by Octave-Band (Hz)									
			31.5	63	125	250	500	1k	2k	4k	8k	16k
		dBA	dB	dB	dB	dB	dB	dB	dB	dB	dB	dB
M1	King's Cove PL	40	53	52	43	36	38	37	33	34	27	22
M2	Bridge St.	36	50	49	41	36	34	30	25	28[4]	21	23
M3	Monatiquot St.	45	54	55	59	42	38	37	34	36	24	23
M4	KCBR	37	51	52	43	39	33	31	28	34[4]	20	23
M5	Quincy Park	34	50	51	44	35	31	28	23	22	18	22
M6	O'Brien Towers	41	50	51	46	40	40	38	33	31	20	24

1. 'Nighttime' defined to be between the operational hours of 10PM and 7AM.
2. Broadband ANS-weighted L_{90} (dBA) is the lowest such level observed during daytime hours.
3. Octave-band values correspond to the hourly period when the lowest ANS-weighted L_{90} sound level was observed.
4. MassDEP-defined pure tone in ambient sound level data

Section 6.0

Future Operational Sound Levels

6.0 FUTURE OPERATIONAL SOUND LEVELS

6.1 Noise Sources and Reference Sound Data

This section provides a detailed discussion of the primary components of the proposed Project and their associated reference sound level data. The primary sources of sound associated with the Project will consist of a Solar Taurus 60 gas turbine and related equipment, including lube oil and gas coolers, aboveground gas piping and components, and compressor building air intake fans. The sound level modeling assumes the proposed equipment to be operating simultaneously at full-load.

A tabular summary of the modeled equipment proposed for the Project, the quantity of each unit, and reference sound power level data provided for each unit or calculated from provided sound pressure level data, are presented below in Table 6-1. The data were provided in an acoustical analysis performed by Hoover & Keith Inc. (H&K), report dated January 11, 2017[12], in which the origin of the sound data is described. The exceptions are the Gas Cooler and the Lube Oil Cooler; more recent sound power level data were provided by H&K based on field measurements of existing, similar equipment and incorporated into the modeling. The noise reduction levels for specific pieces of equipment included in the model are summarized in Table 6-2. These data were also provided in the H&K report or estimated by Epsilon based on data used by H&K. The data presented in these tables were utilized in the "Base Case" modeling scenario, to replicate the H&K sound modeling scenario, and an initial sound level evaluation has been performed in this report. Additional "Mitigation Cases" are described in later sections of this report and the results of these cases have been evaluated as well.

[12] Hoover & Keith Inc. *Results of Additional Ambient Sound Survey and Updated Acoustical Analysis of a New Natural Gas Compressor Station Associated with the Proposed Atlantic Bridge Project ("AB Project")*. January 11, 2017.

Table 6-1 Reference Sound Power Level by Source – Base Case

			Sound Power Level per Unit (dB) by Octave Band (Hz)								
Proposed Source	#	Broadband Sound Power Level per Unit dBA	31.5 dB	63 dB	125 dB	250 dB	500 dB	1k dB	2k dB	4k dB	8k dB
Gas Turbine[1]	1	121	110	110	112	112	110	110	112	118	112
Gas Turbine Exhaust[1]	1	126	120	123	120	123	127	119	112	104	96
Gas Turbine Intake[1]	1	153	108	114	120	121	122	124	129	152	144
Gas Cooler[2]	1	91	112	105	94	92	88	85	82	80	75
Lube Oil Cooler[2]	1	89	100	97	94	90	86	83	78	72	65
Aboveground Piping & Components	-	114	98	98	102	95	96	105	110	108	100
Compressor Building Air Intake Fan[3]	2	82	-	-	-	-	82	-	-	-	-

1. Solar Taurus 60 model.
2. Sound power levels differ from those presented in the H&K report based on more recent sound level data obtained from field measurements.
3. A-weighted sound power level was calculated from a sound pressure level. No octave band data were provided. This sound power level includes attenuation from a custom 3-ft duct silencer.

Table 6-2 Modeled Noise Reduction Levels – Base Case

	Noise Reduction Level (dB) by Octave Band (Hz)								
Noise Control	31.5 dB	63 dB	125 dB	250 dB	500 dB	1k dB	2k dB	4k dB	8k dB
Gas Turbine Exhaust Silencer	5	18	25	35	45	45	45	35	25
Gas Turbine Intake Silencer	2	5	12	15	30	45	50	60	60
Gas Turbine Intake Air Filter	1	6	12	18	22	25	25	25	20
Compressor Building[1]	8	12	18	26	32	35	38	40	40
Acoustical Pipe Insulation[2]	-4	-4	0	2	6	10	15	16	16

1. Acoustically-insulated metal building.
2. Estimated by Epsilon based on combined insulation/courtyard effect attenuation level provided in the H&K report.

6.2 Cadna/A Sound Model

Noise impacts from mechanical equipment associated with the Project were predicted using Cadna/A noise calculation software (DataKustik Corporation). This software, which uses the ISO 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation), offers a refined set of computations accounting for local topography, ground attenuation, drop-off with distance, barrier shielding, diffraction around building edges, reflection off building facades, and atmospheric absorption of sound from multiple noise sources.

Inputs and significant parameters included in the model are described below:

Project Layout: The location of all proposed equipment was provided by AGT in a Site Plan drawing number WEYM-A-0020 Rev. 4, dated 2017, included in this report as Figure 6-1. This "Base Case" layout includes a 19-foot courtyard wall for which the Cadna software incorporated realistic sound propagation shielding from multiple noise sources within its boundary.[13]

Sensitive Receptors: Sound levels were evaluated at seven discrete point locations, shown as A through G in Figure 6-2, representing the closest sensitive receptors and property-line locations surrounding the Project. Six of the seven modeling receptors were selected based on the ambient measurement locations. The seventh receptor (G) was included in the modeling to represent the closest residences to the north of the Project in the Germantown neighborhood of Quincy. Each of these seven locations are represented by an ambient measurement location discussed in Section 5. All receptors were modeled at a height of 1.5 meters above ground level to mimic the ears of a typical standing observer.

Terrain Elevation: Elevation contours for the modeling domain, derived from the New England CMGP LiDAR Dataset for the United States Geological Survey (USGS) dated Fall 2013/Spring 2014, were directly imported into Cadna/A, which allowed for consideration of terrain shielding and differences in elevation between sources and receivers, where appropriate.

Source Sound Power Levels: Sound power levels and noise reduction levels were included in the model, as summarized in Tables 6-1 and 6-2, respectively.

Meteorological Conditions: A temperature of 16ºC (60ºF) and a relative humidity of 70% were assumed in the model to reduce atmospheric attenuation in the 500 Hz and 1 kHz octave-bands where the human ear is most sensitive.

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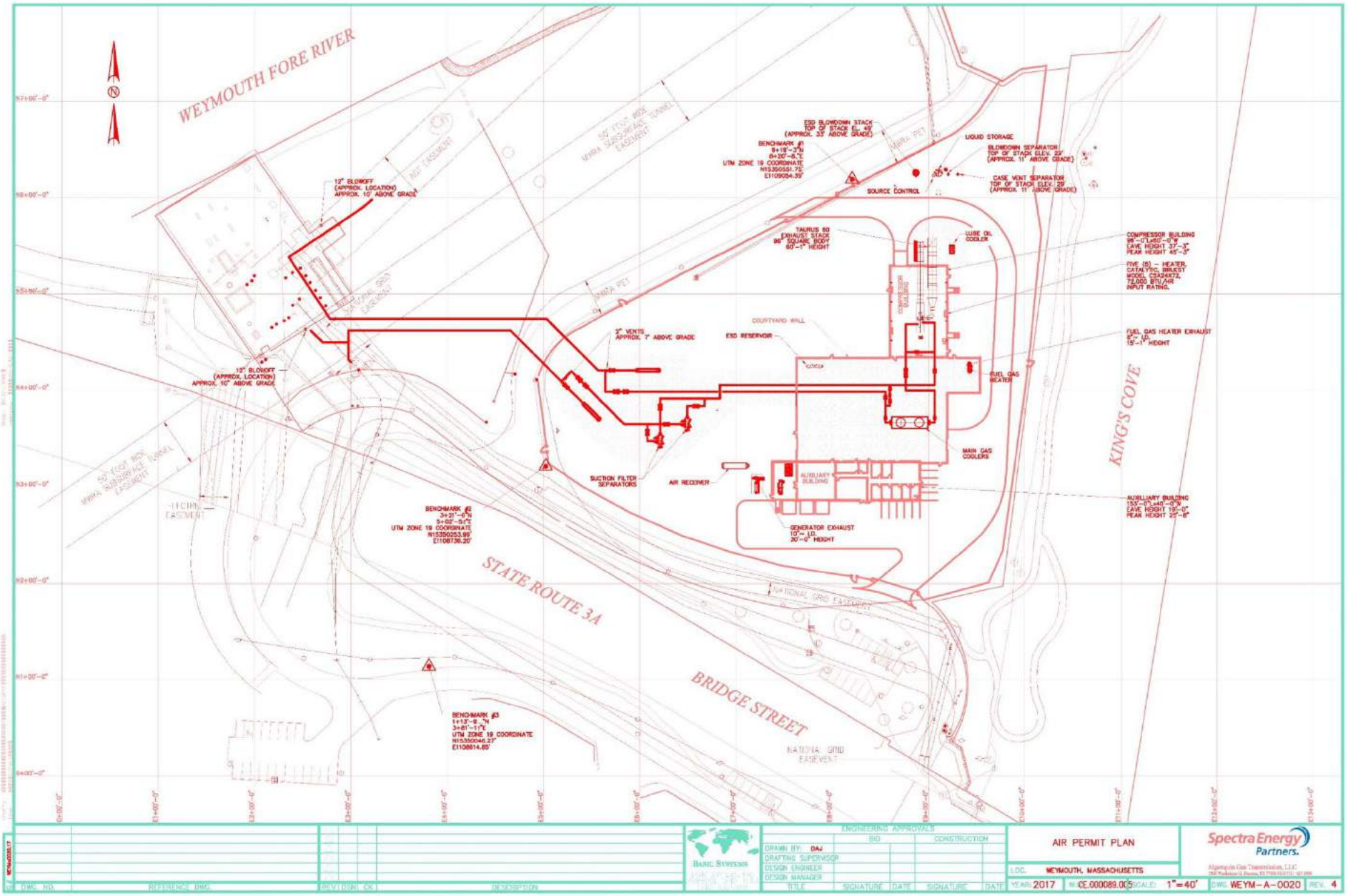
[13] Although not quantified in this report, shielding effects from the courtyard wall are included in all modeled sound levels presented in this analysis.

Ground Attenuation: Spectral ground absorption was calculated using a global G-factor of 0.5 to represent a moderately reflective surface. Project-surrounding areas of water were modeled with a G-factor of 0 to represent a reflective surface.

Uncertainty: A K-factor of 2 dB was included in the modeling results to account for uncertainty in the manufacturers' sound level data and in the sound level modeling.

Directivity: A directivity correction was applied to the gas turbine exhaust stack outlet for a realistic sound propagation representation.



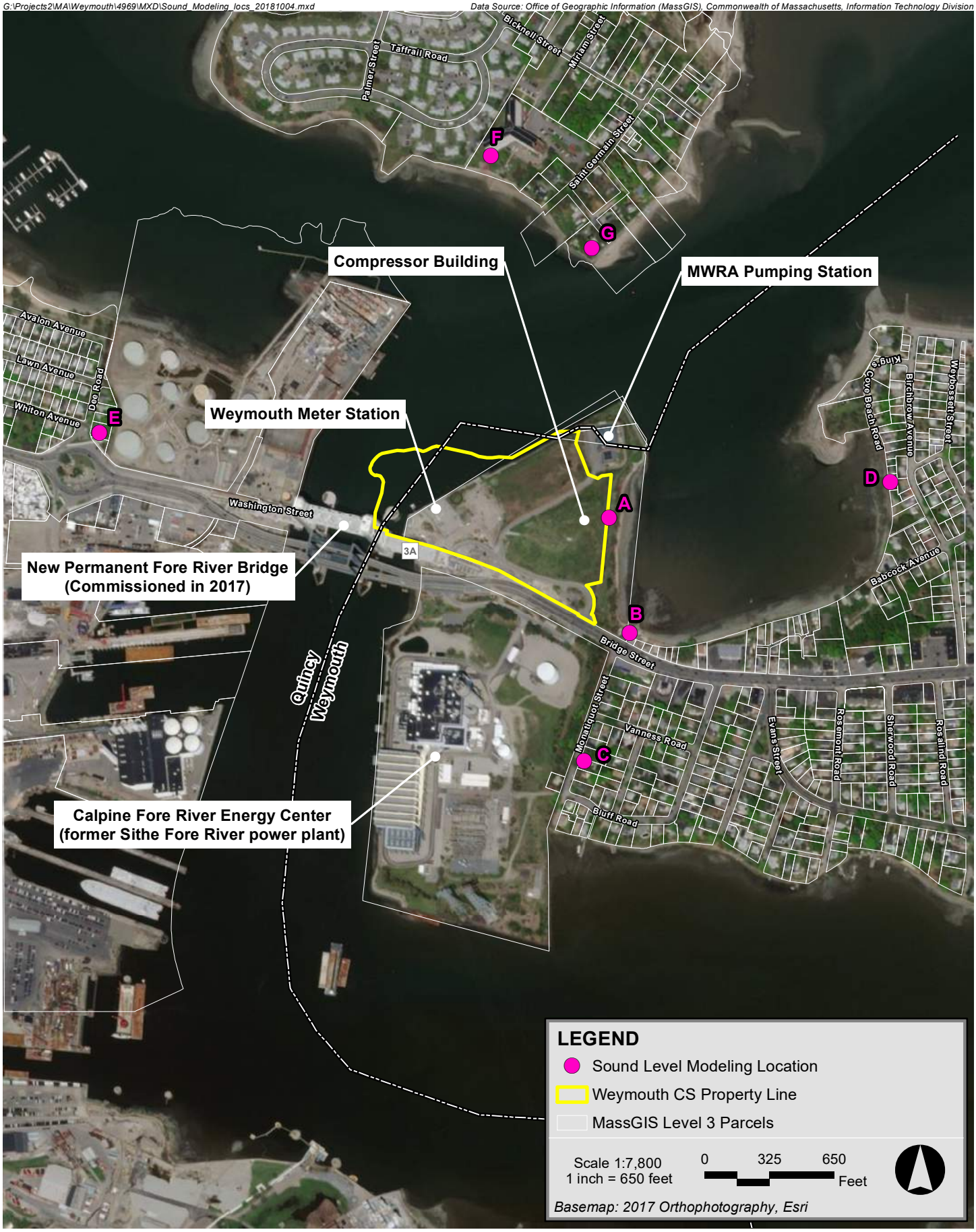
Weymouth Compressor Station Weymouth, Massachusetts

Epsilon ASSOCIATES INC.

Figure 6-1

Project Layout

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division



Weymouth Compressor Station Weymouth, Massachusetts

Epsilon Associates Inc.

Figure 6-2

Sound Level Modeling Locations

6.3 Base Case Operational Sound Levels & Regulatory Evaluation

With the Base Case noise control features identified in Section 6.1 and the shielding benefits from the 19-foot courtyard wall, modeled future daytime and nighttime sound levels from the Project (Project + Background) presented in Tables 6-3A and 6-3B, respectively, are predicted to increase the measured background L_{90} sound levels by no more than 15 dBA at all modeled receptor locations. During daytime hours, Base Case impacts are predicted to be 2 dBA or less at all residential locations, well below the 10 dBA MassDEP criterion. An increase of 11 dBA is expected during the daytime at the King's Cove PL (receptor A). Base Case sound level impacts during nighttime hours are predicted to be 9 dBA or less at all residential receptors, which is also below the 10 dBA MassDEP criterion. The nighttime Base Case impact at the King's Cove PL (receptor A) exceeds the MassDEP criterion. In order to determine what additional noise reduction was possible, how effective it would be and at what cost, a Best Available Noise Control Technology (BANCT) analysis is provided in Section 6.5. Graphical modeling results for the Base Case are shown in Figure 6-3.

Predicted future daytime and nighttime octave-band sound pressure levels, presented in Tables 6-4A and 6-4B, respectively, indicate that the proposed Project would not be anticipated to create any "pure-tone" conditions, as defined by MassDEP, when combined with existing background sound levels at any modeled receptor locations. As Cadna/A does not predict sound levels in the 16 kHz octave-band (not required by ISO-9613), it was conservatively assumed for this analysis they were equivalent to those in the 8 kHz band. In actuality, sound levels in the 16 kHz band would be lower due to increased atmospheric attenuation and typically lower equipment sound power levels.

Table 6-3A MassDEP Daytime[1] Compliance Evaluation – Base Case

Receptor ID	Description	Land Use	Background Noise Level[5]	Modeled Project-Only Noise Level (Proposed)	Combined Project + Background Noise Level	Increase Above Background[2]	Meets MassDEP Noise Policy?[3]
			dBA	dBA	dBA	dBA	
A	King's Cove PL	Public	44	54	55	11	No
B	Bridge St.	Residence	48	44	50	2	Yes
C	Monatiquot St.	Residence	44	40	46	2	Yes
D	KCBR	Residence	40	34	41	1	Yes
E	Quincy Park	Residence	45	35	45	0	Yes
F	O'Brien Towers	Residence	42	37	43	1	Yes
G	Germantown	Residence	42[4]	39	44	2	Yes

1. 'Daytime' defined as the operational hours between 7 AM and 10 PM.
2. 'Increase Above Background' calculated from levels with greater precision than shown in this table, and then rounded to the nearest whole decibel.
3. Refers to MassDEP A-weighted criteria of 10 dBA over background.
4. Background sound level at receptor G is estimated to be equal to the level at receptor F due to proximity.
5. Background sound levels from Table 5-4A.

Table 6-3B MassDEP Nighttime[1] Compliance Evaluation – Base Case

Receptor ID	Description	Land Use	Background Noise Level[5]	Modeled Project-Only Noise Level (Proposed)	Combined Project + Background Noise Level	Increase Above Background[2]	Meets MassDEP Noise Policy?[3]
			dBA	dBA	dBA	dBA	
A	King's Cove PL	Public	40	54	55	15	No
B	Bridge St.	Residence	36	44	45	9	Yes
C	Monatiquot St.	Residence	45	40	46	1	Yes
D	KCBR	Residence	37	34	39	2	Yes
E	Quincy Park	Residence	34	35	38	4	Yes
F	O'Brien Towers	Residence	41	37	43	2	Yes
G	Germantown	Residence	41[4]	39	43	2	Yes

1. 'Nighttime' defined as the operational hours between 10 PM and 7 AM.
2. 'Increase Above Background' calculated from levels with greater precision than shown in this table, and then rounded to the nearest whole decibel.
3. Refers to MassDEP A-weighted criteria of 10 dBA over background.
4. Background sound level at receptor G is estimated to be equal to the level at receptor F (proximity).
5. Background sound levels from Table 5-4B.

Table 6-4A Sound Level Modeling Results by Octave-Band – Proposed Equipment + Daytime[1] Background—Base Case

		Sound Levels (dB) per Octave-Band Center Frequency (Hz)									
Receptor ID	Broadband	31.5	63	125	250	500	1k	2k	4k	8k	16k
	dBA	dB	dB	dB	dB	dB	dB	dB	dB	dB	dB
A	55	77	70	61	53	50	47	43	40	32	32
B	50	65	59	54	47	45	47	43	34	24	23
C	46	61	59	57	43	39	40	37	32	28	23
D	41	59	56	49	41	36	36	33	30	24	23
E	45	57	55	49	41	40	42	38	26	19	22
F	43	58	55	48	41	40	40	37	33	22	30
G	44	59	55	49	42	40	40	38	33	22	30

1. 'Daytime' defined as the operational hours between 7 AM and 10 PM.

Table 6-4B Sound Level Modeling Results by Octave-Band – Proposed Equipment + Nighttime[1] Background—Base Case

Receptor ID	Broadband	Sound Levels (dB) per Octave-Band Center Frequency (Hz)									
	dBA	31.5 dB	63 dB	125 dB	250 dB	500 dB	1k dB	2k dB	4k dB	8k dB	16k dB
A	55	77	70	61	53	49	47	42	40	33	32
B	45	64	57	50	41	38	40	38	33	21	23
C	46	60	56	59[2]	43	39	40	37	36	24	23
D	39	58	54	45	40	34	33	29	34[2]	20	23
E	38	55	53	45	36	32	33	30	23	18	22
F	43	57	54	47	40	40	39	35	31	20	24
G	43	58	54	48	41	40	40	36	31	20	24

1. 'Nighttime' defined as the operational hours between 10 PM and 7 AM.
2. MassDEP-defined pure tone attributable to the existing ambient sound levels, not the Project.

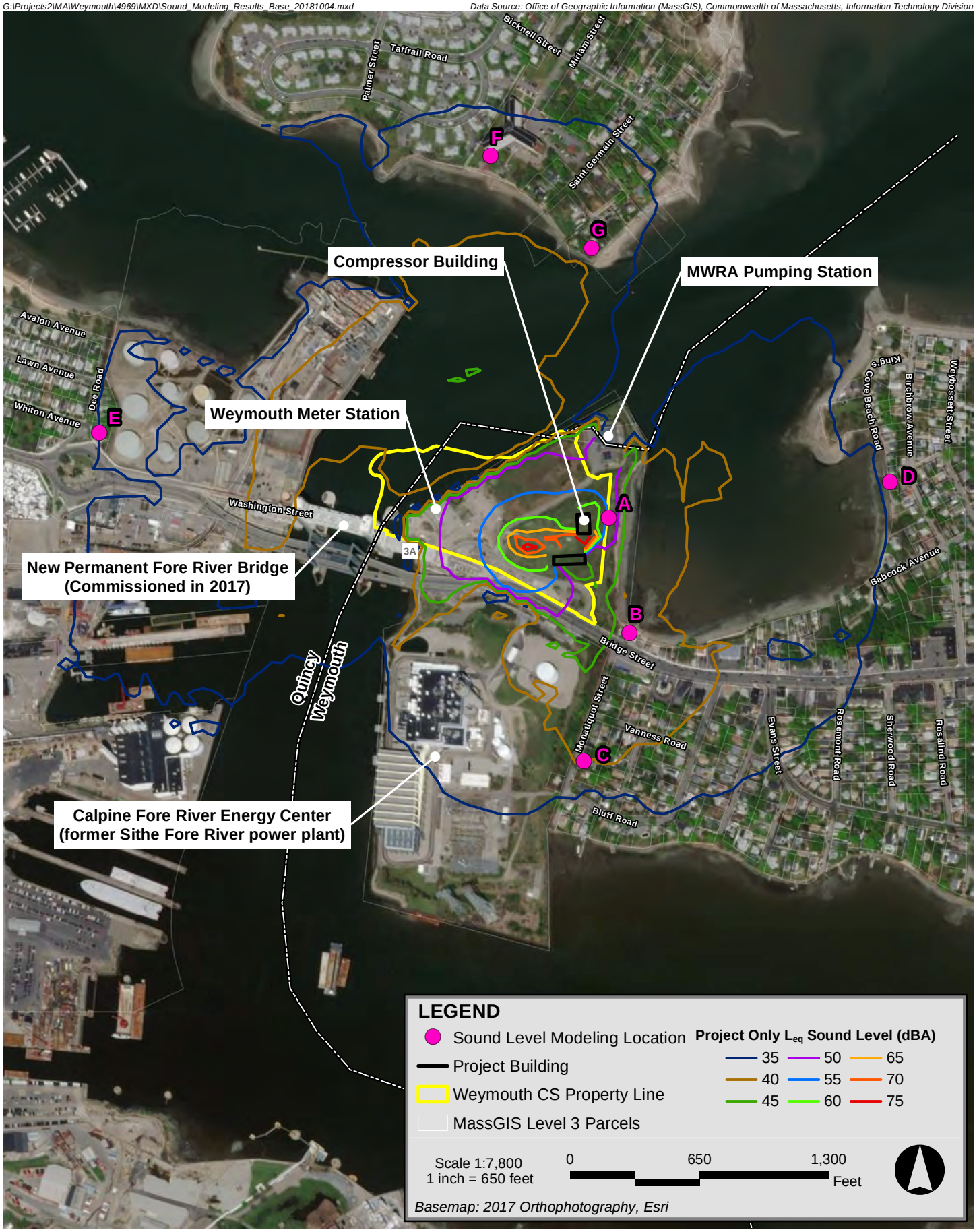
6.4 Base Case Mitigation Measures and Costing

Significant attention has been paid to reduce sound levels from the proposed Project through a combination of noise controls and enhancements to the equipment layout. As summarized in Table 6-5, the Base Case noise reduction measures identified in Section 6.1 total approximately $5.57 Million.

Table 6-5 Sound Level Reductions – Base Case

Noise Source	Control Method	Approximate Cost (materials and labor)
Gas turbine air intake	5-ft silencer; air intake filter	$235,000
Gas turbine exhaust	2-stage silencer	$1,200,000
Gas turbine compressor building	22-gauge metal; 6-inch insulation; insulated roll-up door; no windows	$1,085,000
Gas turbine compressor building—air intake fans	3-ft silencers	$10,000
Aboveground piping	Acoustical pipe insulation; courtyard barrier wall—19 ft tall, 8.5-inch thick concrete	$1,900,000[1]
Gas cooler	Courtyard barrier wall—19 ft tall, 8.5-inch thick concrete	$1,140,000

1. Cost is for acoustical pipe insulation only.



Weymouth Compressor Station Weymouth, Massachusetts

Figure 6-3

Sound Level Modeling Results – Base Case

6.5 Best Available Noise Control Technology (BANCT) Analysis

The results of the Base Case modeling indicate that the Project operating at full capacity is expected to increase sound levels up to 9 dBA or less over the quietest nighttime background at all residential receptors. The Base Case scenario produces sound levels at the King's Cove PL of more than 10 dBA over the quietest background. There are a few additional noise control measures that are possible for some of the noise sources. Therefore, a Best Available Noise Control Technology (BANCT) analysis was conducted. The BANCT analysis examines whether any additional or alternative noise control measures are technically feasible and cost-effective beyond the rigorous controls already proposed in the Base Case, as described in Section 6.4 above. The following analysis compares other acoustical design options to the proposed Base Case design to determine whether the application of additional noise controls can yield further acoustic benefits.

The BANCT analysis takes the "top down" approach, similar to a BACT analysis for air emissions. However, the control of noise is unlike the control of air emissions. A combustion turbine requires only one source to be controlled for each pollutant. The same turbine installation has many sound sources, which requires a systematic reduction of sound levels from individual contributing sources. Since total sound levels are combined logarithmically, any additional noise control must focus on the highest contributing sources first before moving to lesser contributing sources. For example, further controlling a component that is already 5 dBA quieter than the loudest source will have minimal impact on total Project sound levels.

The analysis of the technical feasibility and cost effectiveness of additional noise control measures involves an understanding of the locations and sensitivities of various types of receiving locations as well as the directionality of Project noise sources. The proposed design has focused on the use of proven and cost-effective means to minimize the sound levels at the nearest property line and nearby residential properties. The Base Case modeling showed operation of the Station results in a 1 to 9 dBA increase in the ambient baseline levels during the quietest hours of the night. During daytime hours, when ambient levels are higher, the facility will be less noticeable.

The Base Case modeling results at the closest receptor to the King's Cove PL (receptor A) show that the top three sources contributing to the total sound are the lube oil cooler and the two gas turbine compressor building air intake fans. Several additional noise control features have been investigated. They are summarized below and would result in an incremental cost of approximately $850,000. This is labeled as Mitigation Case 1.

- Quieter lube oil cooler - ~$50,000
- Using 5-ft silencers, instead of 3-ft silencers, on the compressor building air intake fans - ~$15,000

- Additional compressor building roll-up door - ~$15,000
- Replacing the metal-skinned gas compressor building with an 8.5-inch thick concrete block building - ~$628,000
- Increased turbine exhaust silencer system noise reduction - ~$105,000
- Increased turbine intake silencer system noise reduction - ~$35,000

The results of Mitigation Case 1 are shown in Tables 6-6A (daytime) and 6-6B (nighttime). Figure 6-4 depicts the results graphically.

Table 6-6A Sound Level Modeling Results by Octave-Band – Proposed Equipment + Daytime[1] Background—Mitigation Case 1

		Sound Levels (dB) per Octave-Band Center Frequency (Hz)									
Receptor ID	Broadband dBA	31.5 dB	63 dB	125 dB	250 dB	500 dB	1k dB	2k dB	4k dB	8k dB	16k dB
A	50	75	67	56	48	47	44	40	37	28	27
B	49	63	58	53	46	44	47	43	34	24	23
C	46	60	59	57	43	39	40	37	32	28	23
D	41	57	56	49	40	36	36	33	30	24	23
E	45	56	55	49	41	40	42	38	26	19	22
F	43	57	55	48	41	40	40	37	33	22	30
G	44	58	55	49	41	40	40	38	33	22	30

1. 'Daytime' defined as the operational hours between 7 AM and 10 PM.

Table 6-6B Sound Level Modeling Results by Octave-Band – Proposed Equipment + Nighttime[1] Background—Mitigation Case 1

		Sound Levels (dB) per Octave-Band Center Frequency (Hz)									
Receptor ID	Broadband dBA	31.5 dB	63 dB	125 dB	250 dB	500 dB	1k dB	2k dB	4k dB	8k dB	16k dB
A	49	75	67	56	48	46	43	39	36	29	27
B	44	62	56	49	40	37	40	38	33	21	23
C	46	58	56	59[2]	43	39	40	37	36	24	23
D	38	56	53	45	39	34	32	29	34[2]	20	23
E	37	54	52	45	36	32	33	30	23	18	22
F	43	55	53	47	40	40	39	35	31	20	24
G	43	56	53	48	40	40	40	36	31	20	24

1. 'Nighttime' defined as the operational hours between 10 PM and 7 AM.
2. MassDEP-defined pure tone attributable to the existing ambient sound levels, not the Project.

The Mitigation Case 1 modeling results at the closest receptor, the King's Cove PL (receptor A), show that the top source contributing to the total sound is still the lube oil cooler. All other sources are more than two decibels lower than the lube oil cooler. At this point, the only further mitigation option for the lube oil cooler is a barrier wall (Mitigation Case 2), or relocating the lube oil cooler to inside the courtyard wall (Mitigation Case 3). For Mitigation Case 2, a 12-foot high solid barrier wall was modeled surrounding the lube oil cooler on the east side. The location of the lube oil cooler barrier wall is shown in Figure 6-5. This would result in an incremental cost of approximately $241,000 over Mitigation Case 1.

The results of Mitigation Case 2 are shown in Tables 6-7A (daytime) and 6-7B (nighttime). Figure 6-6 depicts the results graphically. These results are identical to Mitigation Case 1 except for a 2 dBA decrease in sound levels directly across from the lube oil cooler.

Table 6-7A Sound Level Modeling Results by Octave-Band – Proposed Equipment + Daytime[1] Background—Mitigation Case 2

		Sound Levels (dB) per Octave-Band Center Frequency (Hz)									
Receptor ID	Broadband	31.5	63	125	250	500	1k	2k	4k	8k	16k
	dBA	dB	dB	dB	dB	dB	dB	dB	dB	dB	dB
A	48	74	66	55	46	46	43	39	37	26	25
B	49	63	58	53	46	44	47	43	34	24	23
C	46	60	59	57	43	39	40	37	32	28	23
D	41	57	55	49	40	36	36	33	30	24	23
E	45	56	55	49	41	40	42	38	26	19	22
F	43	57	55	48	41	40	40	37	33	22	30
G	44	58	55	49	41	40	40	38	33	22	30

1. 'Daytime' defined as the operational hours between 7 AM and 10 PM.

Table 6-7B Sound Level Modeling Results by Octave-Band – Proposed Equipment + Nighttime[1] Background—Mitigation Case 2

		Sound Levels (dB) per Octave-Band Center Frequency (Hz)									
Receptor ID	Broadband	31.5	63	125	250	500	1k	2k	4k	8k	16k
	dBA	dB	dB	dB	dB	dB	dB	dB	dB	dB	dB
A	47	74	66	54	46	44	41	37	36	28	25
B	44	62	55	49	40	37	40	38	33	21	23
C	46	58	56	59[2]	43	39	40	37	36	24	23
D	38	56	53	44	39	34	32	29	34[2]	20	23
E	37	54	52	45	36	32	33	30	23	18	22
F	43	55	53	47	40	40	39	35	31	20	24
G	43	56	53	48	40	40	40	36	31	20	24

1. 'Nighttime' defined as the operational hours between 10 PM and 7 AM.
2. MassDEP-defined pure tone attributable to the existing ambient sound levels, not the Project.

Mitigation Case 3 relocates the lube oil cooler inside the 19-foot high courtyard wall. The relocated lube oil cooler is shown in Figure 6-7. This would result in an incremental cost of approximately $15,000 over Mitigation Case 1.

The results of Mitigation Case 3 are shown in Tables 6-8A (daytime) and 6-8B (nighttime). Figure 6-8 depicts the results graphically.

Table 6-8A Sound Level Modeling Results by Octave-Band – Proposed Equipment + Daytime[1] Background—Mitigation Case 3

		Sound Levels (dB) per Octave-Band Center Frequency (Hz)									
Receptor ID	Broadband dBA	31.5 dB	63 dB	125 dB	250 dB	500 dB	1k dB	2k dB	4k dB	8k dB	16k dB
A	49	75	67	55	46	46	43	39	37	28	27
B	49	63	58	53	46	44	47	43	34	24	23
C	46	60	59	57	43	39	40	37	32	28	23
D	41	57	56	49	40	36	36	33	30	24	23
E	45	56	55	49	41	40	42	38	26	19	22
F	43	57	55	48	41	40	40	37	33	22	30
G	44	58	55	49	41	40	40	38	33	22	30

1. 'Daytime' defined as the operational hours between 7 AM and 10 PM.

Table 6-8B Sound Level Modeling Results by Octave-Band – Proposed Equipment + Nighttime[1] Background—Mitigation Case 3

		Sound Levels (dB) per Octave-Band Center Frequency (Hz)									
Receptor ID	Broadband dBA	31.5 dB	63 dB	125 dB	250 dB	500 dB	1k dB	2k dB	4k dB	8k dB	16k dB
A	47	75	67	54	46	44	41	37	36	29	27
B	44	62	55	49	40	37	40	38	33	21	23
C	46	58	56	59[2]	43	39	40	37	36	24	23
D	38	56	53	44	39	34	32	29	34[2]	20	23
E	37	54	52	45	36	32	33	30	23	18	22
F	42	55	53	47	40	40	39	35	31	20	24
G	43	56	53	48	40	40	40	36	31	20	24

1. 'Nighttime' defined as the operational hours between 10 PM and 7 AM.
2. MassDEP-defined pure tone attributable to the existing ambient sound levels, not the Project.

With the Base Case + Mitigation Case 1 + Mitigation Case 3 noise control features identified in the BANCT analysis, modeled future daytime and nighttime sound levels from the Project (Project + Background) are presented in Tables 6-9A and 6-9B, respectively. Sound levels are predicted to increase the measured background L_{90} sound levels by no more than 8 dBA at all modeled receptor locations. During daytime hours, Mitigation Case 3 impacts are predicted to be 2 dBA or less at all residential locations. An increase of 5 dBA is expected during the daytime at the King's Cove PL (receptor A). Mitigation Case 3 sound level impacts during nighttime hours are predicted to be 8 dBA or less at all residential receptors.

Table 6-9A MassDEP Daytime[1] Compliance Evaluation – Base Case + Mitigation Case 1 + Mitigation Case 3

Receptor ID	Description	Land Use	Background Noise Level[5]	Modeled Project-Only Noise Level[6] (Proposed)	Combined Project + Background Noise Level	Increase Above Background[2]	Meets MassDEP Noise Policy?[3]
			dBA	dBA	dBA	dBA	
A	King's Cove PL	Public	44	47	49	5	Yes
B	Bridge St.	Residence	48	44	49	1	Yes
C	Monatiquot St.	Residence	44	40	46	2	Yes
D	KCBR	Residence	40	31	41	1	Yes
E	Quincy Park	Residence	45	35	45	0	Yes
F	O'Brien Towers	Residence	42	36	43	1	Yes
G	Germantown	Residence	42[4]	38	44	2	Yes

1. 'Daytime' defined as the operational hours between 7 AM and 10 PM.
2. 'Increase Above Background' calculated from levels with greater precision than shown in this table, and then rounded to the nearest whole decibel.
3. Refers to MassDEP A-weighted criteria of 10 dBA over background.
4. Background sound level at receptor G is estimated to be equal to the level at receptor F due to proximity.
5. Background sound levels from Table 5-4A.
6. Project-Only levels include +2 dB uncertainty factor.

Table 6-9B MassDEP Nighttime[1] Compliance Evaluation – Base Case + Mitigation Case 1 + Mitigation Case 3

Receptor ID	Description	Land Use	Background Noise Level[5]	Modeled Project-Only Noise Level[6] (Proposed)	Combined Project + Background Noise Level	Increase Above Background[2]	Meets MassDEP Noise Policy?[3]
			dBA	dBA	dBA	dBA	
A	King's Cove PL	Public	40	47	47	7	Yes
B	Bridge St.	Residence	36	44	44	8	Yes
C	Monatiquot St.	Residence	45	40	46	1	Yes
D	KCBR	Residence	37	31	38	1	Yes
E	Quincy Park	Residence	34	35	37	3	Yes
F	O'Brien Towers	Residence	41	36	42	1	Yes
G	Germantown	Residence	41[4]	38	43	2	Yes

1. 'Nighttime' defined as the operational hours between 10 PM and 7 AM.
2. 'Increase Above Background' calculated from levels with greater precision than shown in this table, and then rounded to the nearest whole decibel.
3. Refers to MassDEP A-weighted criteria of 10 dBA over background.
4. Background sound level at receptor G is estimated to be equal to the level at receptor F (proximity).
5. Background sound levels from Table 5-4B.
6. Project-Only levels include +2 dB uncertainty factor.

6.6 Proposed Case Evaluation

Table 6-10 summarizes the A-weighted results of the Base Case, Mitigation Case 1, Mitigation Case 2, and Mitigation Case 3. The list below summarizes the Base Case cost of noise control, and the incremental cost of each additional mitigation scenario.

- Base Case ~ $5,570,000
- Mitigation Case 1 ~$850,000
- Mitigation Case 2 ~$241,000
- Mitigation Case 3 ~$15,000

As Table 6-10 shows, Mitigation Case 2 provides only a slightly better sound reduction at one location (King's Cove PL; receptor A) as compared to Mitigation Case 1 for an incremental cost of approximately $241,000. This is a location where people spend a short amount of time as compared to residences. Mitigation Case 3 results are equal to or slightly lower than Mitigation Case 1 for an incremental cost of approximately $15,000. At the residences, Mitigation Case 3, and the more than $6.4 Million dollars in noise control

investment, provides similar sound reduction as Mitigation Case 2. Therefore, for this project, all the noise controls assumed in the Base Case[14], Mitigation Case 1, and Mitigation Case 3 represent BANCT for this Project. Table 6-11 provides the final list of noise controls assumed for the Station.

All sound level increases at all residences will be well below 10 dBA as compared to the quietest L_{90} background value. All sources have been provided with the best available noise controls. Sound levels from the Station under worst-case conditions may be 8 dBA over the quietest nighttime background at the nearest residence on Bridge Street (receptor B). However, this includes several very conservative assumptions:

- The lube oil cooler sound levels assume a worst-case 100 degrees F day. This will not occur here at night. Therefore, sound levels from this piece of equipment will be lower at night.

- The King's Cove PL is not occupied at night, especially at 2:00-3:00 AM when the lowest background occurs.

- The quietest L_{90} background at this location occured for one hour (see Figure B2-2 in Appendix B), and only occurred one night during the eight-day program. Increases over background are generally much less than 6 dBA during the night.

- The modeling results include the 2 dBA uncertainty factor. Actual predicted increases are 6 dBA at night at the Bridge Street receptors.

[14] BANCT includes all of the noise controls in the Base Case, except for the items that are enhanced or upgraded in Mitigation Case 1, plus the action in Mitigation Case 3.

Table 6-10 Increase Above Quietest L_{90} Background[3] – All Cases

Receptor ID	Description	Land Use	Daytime[1]				Nighttime[2]			
			Base Case	Base Case + Mit. Case 1	Base Case + Mit. Case 1 + Mit. Case 2	Base Case + Mit. Case 1 + Mit. Case 3[4]	Base Case	Base Case + Mit. Case 1	Base Case + Mit. Case 1 + Mit. Case 2	Base Case + Mit. Case 1 + Mit. Case 3[4]
A	King's Cove PL	Public	11	6	4	5	15	9	7	7
B	Bridge St.	Residence	2	1	1	1	9	8	8	8
C	Monatiquot St.	Residence	2	2	2	2	1	1	1	1
D	KCBR	Residence	1	1	1	1	2	1	1	1
E	Quincy Park	Residence	0	0	0	0	4	3	3	3
F	O'Brien Towers	Residence	1	1	1	1	2	2	2	1
G	Germantown	Residence	2	2	2	2	2	2	2	2

1. 'Daytime' defined as the operational hours between 7 AM and 10 PM.
2. 'Nighttime' defined as the operational hours between 10 PM and 7 AM.
3. 'Increase Above Background' calculated from levels with greater precision than shown in this table, and then rounded to the nearest whole decibel.
4. This is the Proposed Case.

Table 6-11 Noise Control Commitments – BANCT Analysis

Noise Source	Control Method	Case
Aboveground piping	Acoustical pipe insulation; courtyard barrier wall—19 ft tall, 8.5-inch thick concrete	Base Case
Gas cooler	Courtyard barrier wall—19 ft tall, 8.5-inch thick concrete	Base Case
Gas turbine air intake	5-ft silencer; air intake filter; increased silencer reduction	Base Case + Mitigation Case 1
Gas turbine exhaust	2-stage silencer; increased silencer reduction	Base Case + Mitigation Case 1
Gas turbine compressor building	8.5-inch concrete block building; Double insulated roll-up door; no windows	Mitigation Case 1
Gas turbine compressor building—air intake fans	5-ft silencers	Mitigation Case 1
Lube oil cooler	Quieter model	Mitigation Case 1
Lube oil cooler	Relocate behind 19-ft tall courtyard barrier wall	Mitigation Case 3

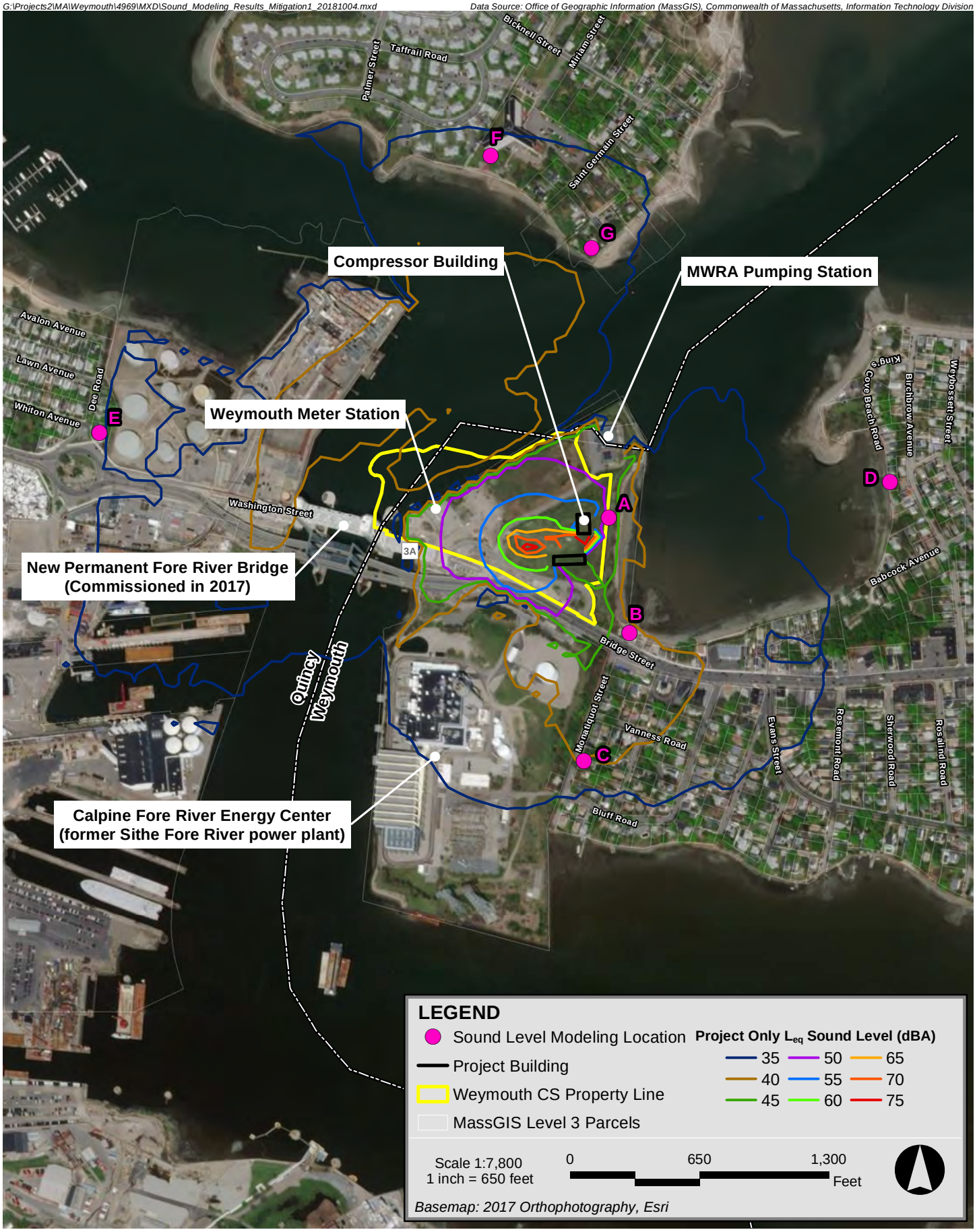


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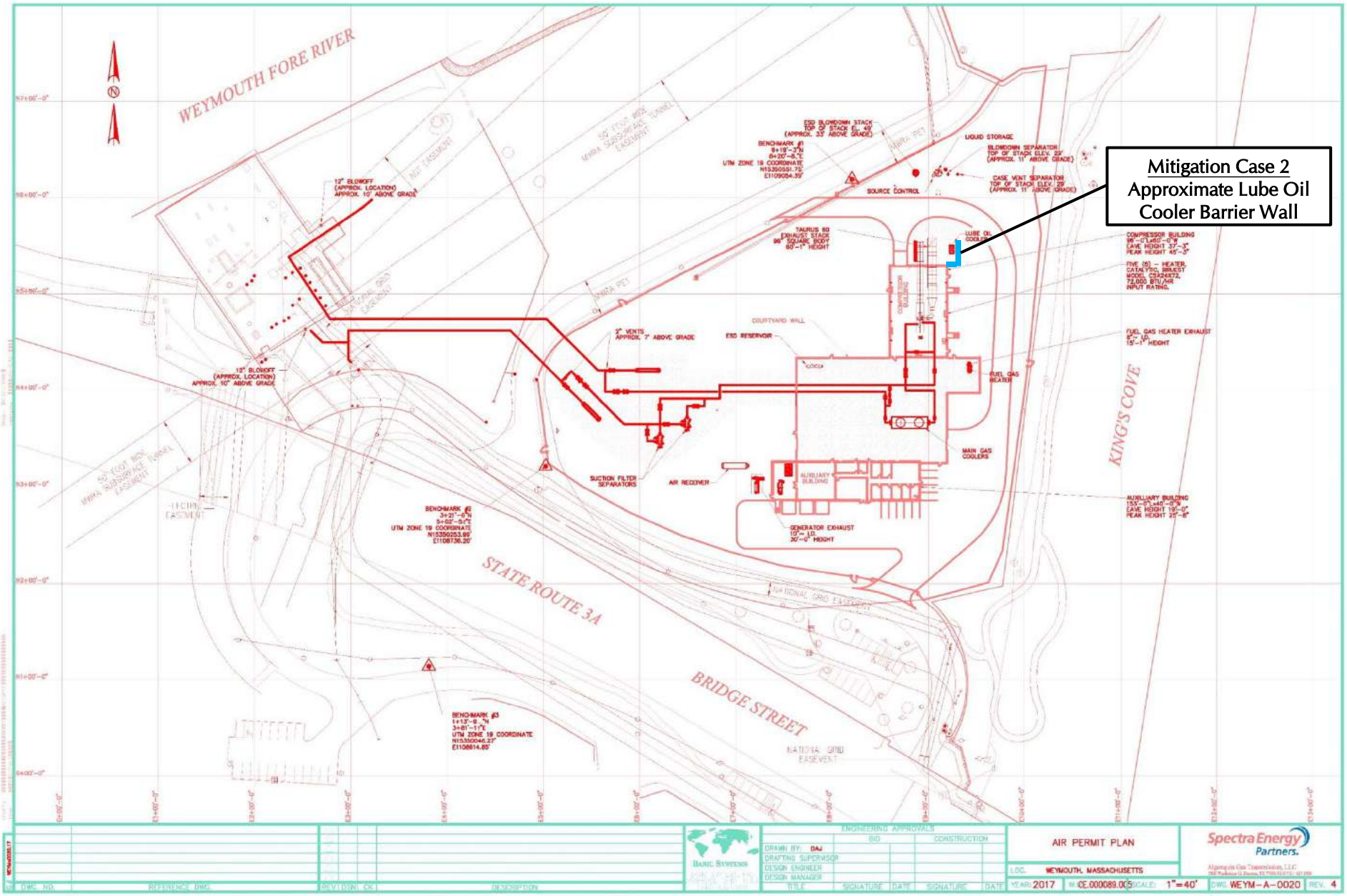
Figure 6-4

Sound Level Modeling Results – Mitigation Case 1

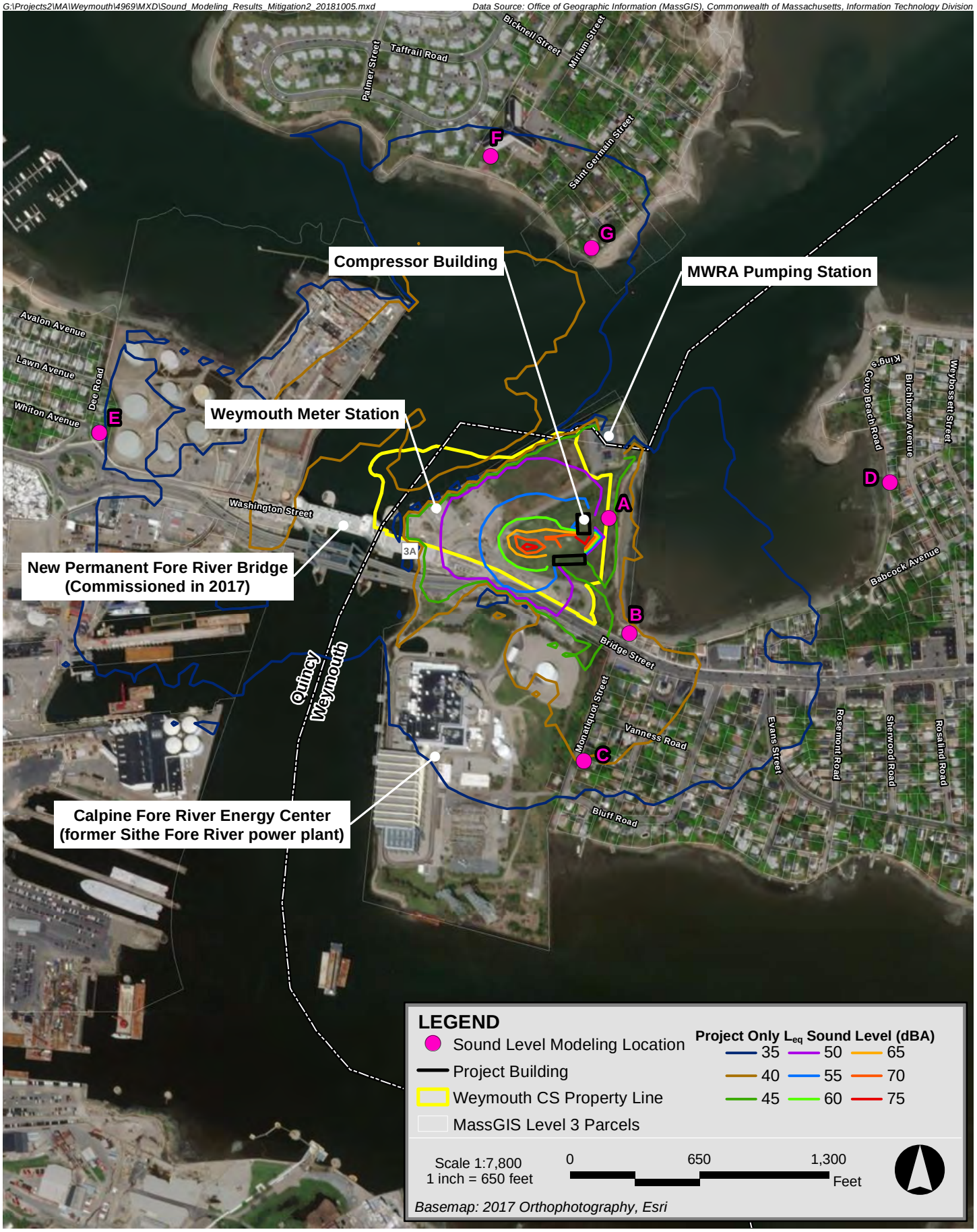


Weymouth Compressor Station Weymouth, Massachusetts

Epsilon ASSOCIATES INC.

Figure 6-5

Project Layout - Mitigation Case 2



Weymouth Compressor Station Weymouth, Massachusetts

Epsilon Associates Inc.

Figure 6-6

Sound Level Modeling Results – Mitigation Case 2

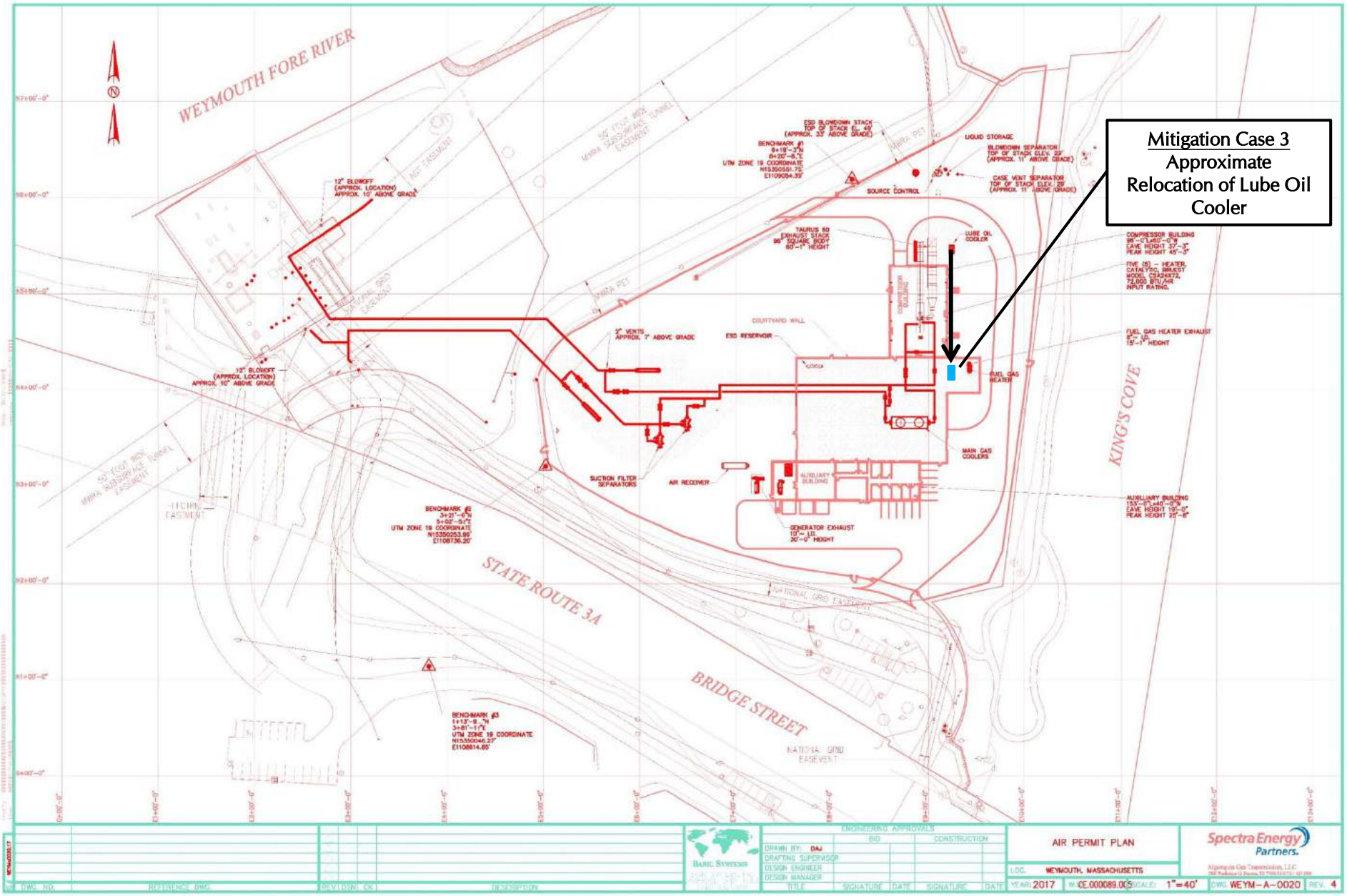


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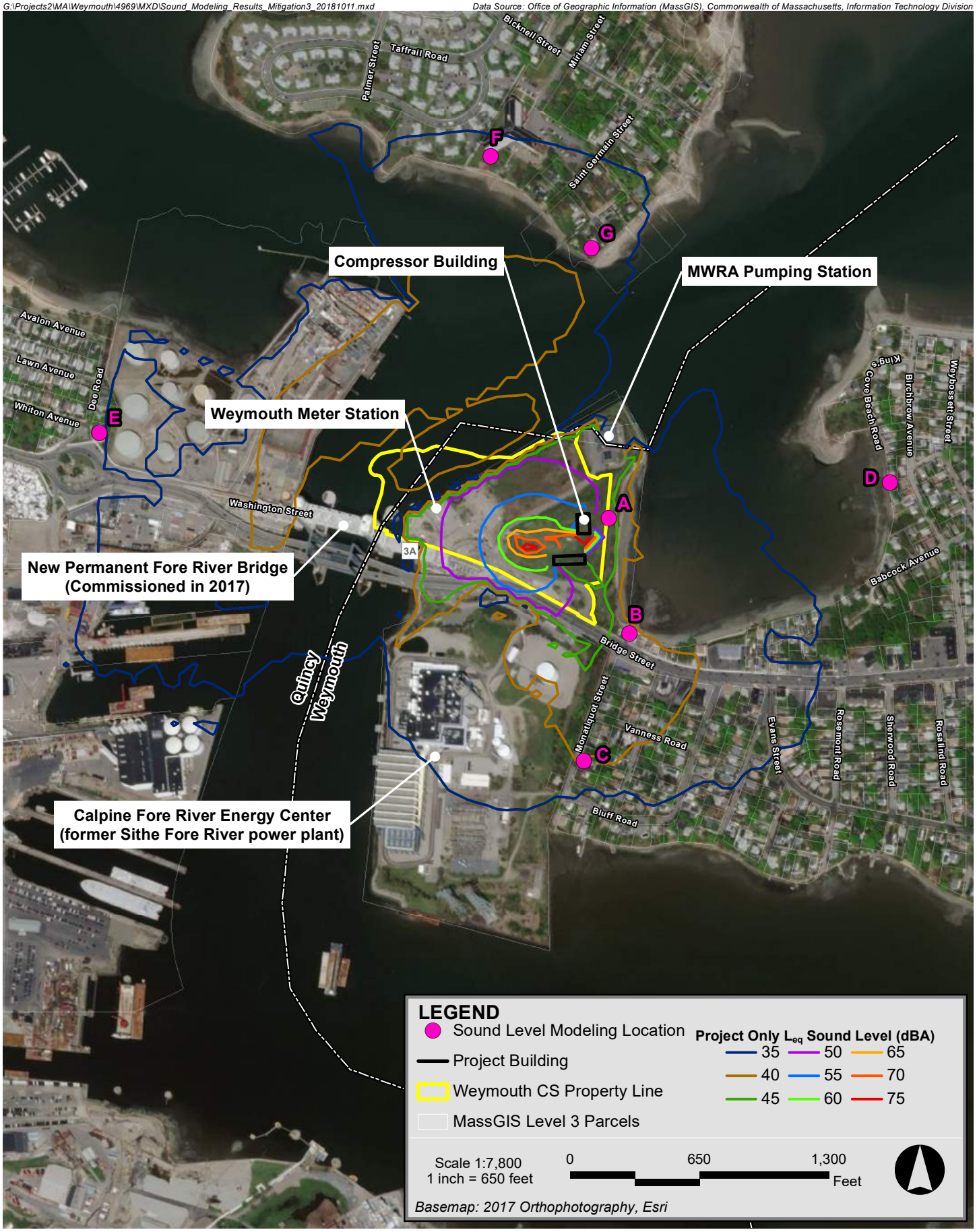
Figure 6-7

Project Layout - Mitigation Case 3



Weymouth Compressor Station **Weymouth, Massachusetts**

Epsilon Associates Inc.

Figure 6-8

Sound Level Modeling Results – Mitigation Case 3

Section 7.0

Other Sound Sources

7.0 OTHER SOUND SOURCES

7.1 Minor Sources

A few potential sources will not contribute any meaningful sound off-site either because they are so well controlled or because they have a low sound power level. These sources were not included in the operational sound model and are discussed below.

Two air conditioning (AC) condenser units to service the control room building. These are similar to residential AC units; they will be located adjacent to the control room building inside the courtyard wall, and thus are negligible sources in the community.

The horizontal exhaust ductwork between the compressor building and turbine exhaust stack will be well controlled through the use of 6-inch insulation lining the ductwork, and will contribute less than 30 dBA at the nearest property line. This is well below the other primary sources and thus was not included in the model.

7.2 Infrequent Intermittent Sources

There are some sources of sound related to maintenance activities at the Station that may occur from time to time, but not so regularly that they were included in the operational sound model. Additionally, it is important to note that intermittent sources occurring for maintenance purposes will not occur at the same time the Station is operating. The noteworthy sources are identified here and discussed with respect to frequency of occurrence, expected duration, and approximate expected sound level. There will not be any sirens located outdoors at this facility.

Stand-by emergency generator. The purpose of this 405 kW unit is to provide electricity to the Station in the event of a commercial power loss. This unit is expected to run once per month for one hour of routine maintenance and readiness testing. This testing will be done during normal weekday daytime business hours sometime between 7 AM and 5 PM. The MassDEP allows up to 100 hours/year for this type of testing.

Case vent blowdown. A compressor unit gas blowdown occurs when it is necessary to vent natural gas between the suction/discharge valves and compressor to the atmosphere via a case vent separator-silencer. A case vent blowdown occurs infrequently (less than 20 times per year), and persists for a duration of less than three minutes each. The case vent will be fitted with an exhaust silencer designed to limit sound to 49 dBA at 300 feet. The current configuration indicates the case vent separator-silencer will be approximately 100 feet from the east property line.

Section 8.0

Conclusion

8.0 CONCLUSION

Substantial noise mitigation measures totaling more than $6.4 Million have been incorporated into the design of the proposed Project to minimize noise impacts in the community. Results of a complete sound level assessment demonstrate that noise levels from the Project will comply with the requirements set forth in the MassDEP Noise Policy, and have been reduced to the maximum extent practicable using a BANCT analysis.

Appendix A
Sound Level Measurement Protocol and MassDEP Comments

Weymouth Natural Gas Compressor Station Project
Algonquin Gas Transmission, LLC
Weymouth, MA

Sound Level Measurement Protocol

June 26, 2018

Introduction

Epsilon Associates, Inc. ("Epsilon") will perform a sound level impact assessment to determine how the addition of a natural gas compressor station will affect community noise levels. As part of this effort, Epsilon will conduct a sound level measurement program to document existing ambient sound levels surrounding the location of the Weymouth Compressor Station ("the Project") proposed by Algonquin Gas Transmission, LLC ("Algonquin"). The Project will be located on property owned by Algonquin just east of the Fore River Bridge off Bridge Street, Weymouth, MA.

The purpose of this document is to describe the selection of baseline monitoring locations, measurement methodology, and acoustical equipment proposed. This protocol lays out the process for establishing ambient sound levels as a component of evaluating the Project for compliance with MassDEP Noise Policy DAQC 90-001). The protocol will be submitted to MassDEP for review and approval prior to commencement of this sound level measurement program.

Measurement Locations

To identify current noise levels in the area, a baseline study will be conducted by Epsilon. Background sound levels will be measured at six (6) discrete locations within the surrounding project area. These monitoring sites, described below, have been selected to establish an ambient sound pressure level at the nearest receptor locations in all relevant directions from the Project as well as at the property line.

- **Location M1** has been selected for continuous monitoring to represent sound levels at the closest property line immediately east of the Project. This location is approximately 135 feet east of the center of the compressor station building. This location also represents existing sound levels along the walking path that goes through the public park located in the Fore River Basin south of the MWRA pumping station within the King's Cove conservation area. M1 will be located within the Project fence line as close as practical to the property line.

- **Location M2** has been selected for continuous monitoring to represent sound levels at the nearest residences to the southeast. This location is at a Town-owned parcel along Bridge Street, approximately 865 feet from the center of the compressor station building.

- **Location M3** has been selected for continuous monitoring to represent sound levels at the nearest residences to the south, which are set back from Bridge Street traffic. M3 will be located just within the Fore River Energy Center fence line near the intersection of Monatiquot Street and Bluff Road. This location is approximately 1,200 feet from the center of the compressor station building.

- **Location M4** has been selected for continuous monitoring to represent sound levels at the nearest residences to the east along King's Cove Road. Permission from a homeowner here is required. This location is approximately 1,565 feet from the center of the compressor station building.

- **Location M5** has been selected for continuous monitoring to represent sound levels at the nearest residences to the west. This location is in Quincy at a City-owned parcel along Washington Street approximately 2,860 feet from the center of the compressor station building.

- **Location M6** has been selected for continuous monitoring to represent sound levels at the nearest residences to the north. The meter will be located in Quincy on the south lawn of the O'Brien Towers south of Bicknell Street. This location is approximately 1,815 feet from the center of the compressor station building.

Figure 1 shows the locations of the monitoring areas proposed for the baseline survey overlaid on an aerial orthophoto along with the location of the project property line, and the surrounding land use.

Duration/Time of Testing

Continuous A-weighted measurements (24 hours/day) will be made concurrently at all six locations over a 7-day period (168 hours per location). The continuous monitors will generally be unattended and data will be logged at 1-hour intervals. Both broadband A-weighted and linear octave band sound levels will be continuously collected and will include: L_{max}, L_{eq}, L_1, L_{10}, and L_{90}. This approach is predicated on obtaining permission from the landowners to set up equipment on their property for one week.

In any instances where private property access is not granted, sound level measurements will be conducted at the nearest safe, publicly accessible point to the

desired measurement location. These measurements will be conducted for two consecutive 24-hour periods (weekdays), and one 24-hour period on a weekend. For the safety of the sound level meters, security guard personnel will take shifts watching over the equipment.

There are two purposes for the continuous monitoring. The first is to establish broadband ambient sound levels to evaluate the future change over background from the Project. The second is to identify octave band sound levels during this ambient condition from which we can determine whether there are any existing pure tones in the area around the site and if there is expected to be any future pure tones based on the addition of the modeling results to these levels. It is important to have personal observations of the noise sources in the area and that is why a period of personal observations is proposed for each location. These times correspond to the overnight period, and a midday period. The sound level meters will be logging the metrics on an hourly basis.

During the continuous measurement program, observations will be made by a field technician at each location during the two time periods mentioned below. Observations will be made at each location for approximately 10 – 15 minutes. These periods include:

- 1 week-day between 10 am and 5 pm (midday period)
- 1 week-night between 11 pm and 3 am (overnight period)

For these observations, any identifiable significant or anomalous interference sound will be excluded for the data set (e.g. emergency vehicle sirens immediately proximate to the site).

Sound Level Measurement Instrumentation

All acoustical instrumentation will conform to ANSI National Standards Institute (ANSI) S1.4 standard for Type 1 (precision) for acoustical measuring devices and to ANSI S1.11-1986 for Octave-Band and Fractional-Octave-Band Analog and Digital Filters. The instrumentation will be capable of measuring and logging the following descriptors in both A-weighted and linear octave band sound levels (6.3 Hz to 20 kHz) over 1-hour intervals (continuous): L_{max}, L_1, L_{10}, L_{90}, and L_{eq}. In addition, broadband A-weighted and octave band sound level data will be collected in one-second time intervals. The sound level meter response shall be set to ANSI "slow". The microphone will be fitted with the manufacturer's windscreen and tripod-mounted approximately 1.5 meters above ground level. The instrumentation will be field-calibrated both before and after each measurement survey with calibrators meeting IEC 942 Class 1L and ANSI S1.40-1984. In addition, all instrumentation will have undergone an independent laboratory calibration traceable to NIST standards within the past 12 months. It is expected that this measurement program will utilize

Larson Davis 831 and/or Norsonic Nor140 sound level meters. All locations will log continuous octave band data.

Meteorological Considerations

Sound level data from periods of precipitation will be excluded from the analysis, as per the measurement protocol specified in ANSI S12.18-1994: "Procedures for Outdoor Measurement of Sound Pressure Level," (§4.4.1.2). Continuous wind speed, wind direction, temperature, and precipitation measurements will be made using an Epsilon 2-meter meteorological tower. Logging will be done on an hourly basis. Sound level data measured during steady wind speeds of 5 m/s or greater (~11 mph) will be excluded per ANSI S12.18-1994.

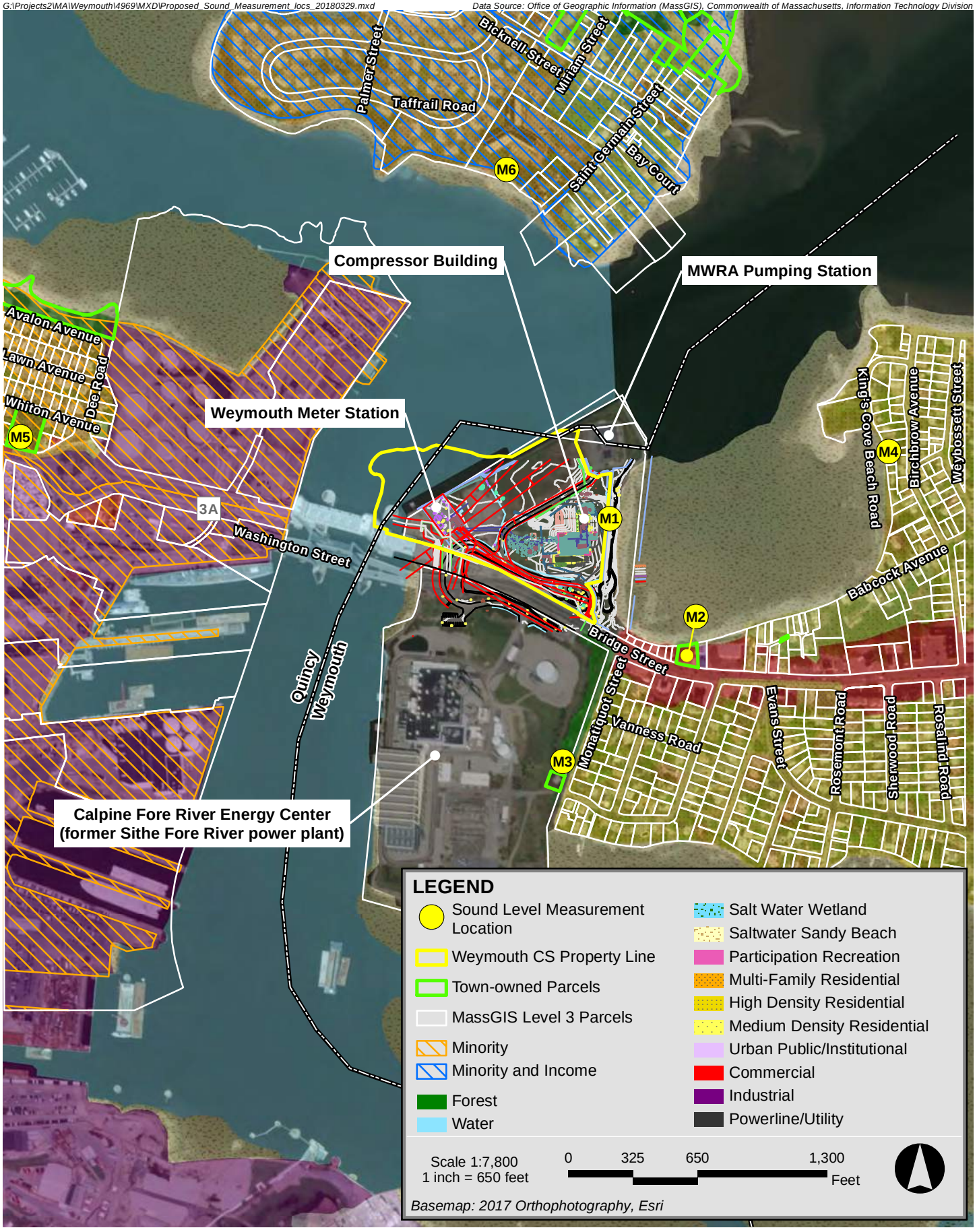
Future Sound Levels & Compliance Evaluation

The noise impacts associated with the Project will be predicted with the Cadna/A noise calculation software developed by DataKustik GmbH using the ISO 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation). The model will consider topography, ground attenuation, drop-off with distance, atmospheric absorption, multiple reflections and screening due to structures. Future sound levels predicted from the model will be added to the measured nighttime L90 background sound levels at each location and the increase over existing levels will be evaluated with respect to the MassDEP noise policy. From the data collected during the 7-day period, ambient background for each monitoring location shall represent the lowest one-hour L90 reading during both daytime (7 AM-10 PM) and nighttime (10 PM-7 AM) periods. If the lowest L90 is an "outlier" (anomalous from other minimum values), it may be discarded and the next lowest L90 value used. Combined future levels will also be evaluated for any "pure tone" conditions as defined in the MassDEP noise policy.

Statement of Qualifications

Epsilon staff has conducted numerous sound level monitoring and modeling studies for energy projects throughout the United States, and is a recognized leader in the industry. Robert O'Neal will be the Principal in charge of this work. Mr. O'Neal has over 30 years of experience, is a Board Certified member of the Institute of Noise Control Engineers (INCE), and has testified as an expert witness on matters of community noise impacts. He will be supported in the modeling and monitoring efforts by members of the Epsilon Acoustics Group.

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division



Weymouth Compressor Station Weymouth, Massachusetts

Epsilon Associates Inc.

Figure 1

Proposed Sound Level Measurement Locations

From:	Kerigan, Kathleen (DEP)
To:	Kate Brown
Cc:	Child, Ralph (RChild@mintz.com); Cushing, Thomas (DEP); Moran, Gary (DEP)
Subject:	[External] AGT Weymouth Noise Monitoring Protocol
Date:	Friday, August 3, 2018 4:28:51 PM

Hi, Kate,

Tom is out this week so I am drafting a quick response to your noise monitoring protocol based on Tom's and the program's feedback. Please let me know if you have any questions and have a nice weekend.

Kate
617-556-1181

1. Page3 – the proposed protocol states that any identifiable significant or anomalous interference sound will be excluded for the data set.
    - **DEP's response**: Anomalous events should be retained in the data set. Brief events are typically factored out when calculating the L90 background. Should you feel certain events interfere with your ability to calculate an L90 that is representative of the neighborhood, please consult with MassDEP prior to excluding the events.
2. Page 4 – the proposed protocol states that if the lowest L90 is determined to be an "outlier" (anomalous from other minimum values), it may be discarded and the next lowest L90 value used.
    - **DEP's response:** Prior to excluding the lowest L90 as an "outlier," please consult with MassDEP for concurrence.

Additionally the department would like to reiterate that in evaluating sound in a plan approval for a new source, similar to the traditional "top-down" BACT process, the "top case" sound suppression/mitigation measures which deliver the lowest sound level increase above background are required to be implemented, unless these measures can be eliminated based upon technological or economic infeasibility. An applicant cannot "model out" of the use of the "top case" sound suppression/ mitigation measures by simply demonstrating that predicted sound levels at the property line when employing a less stringent sound suppression/mitigation strategy will result in a sound level increase of less than or equal to the 10 dBA (decibel, A –Weighted) above background sound level increase criteria contained in the MassDEP Noise Policy. A 10 dBA increase is the maximum increase allowed by MassDEP; it is not the sound level increase upon which the design of sound suppression/mitigation strategies and techniques should be based. Also, take into consideration that the city or town that the project is located in may have a noise ordinance (or similar) that may be more stringent than the criteria in the MassDEP Noise Policy.

Appendix B
Continuous Sound Level and Meteorological Measurement Data

Figure B1-1 - Weymouth Compressor Station Project
Long-Term Hourly L_{90} Sound Pressure Levels- Location M1

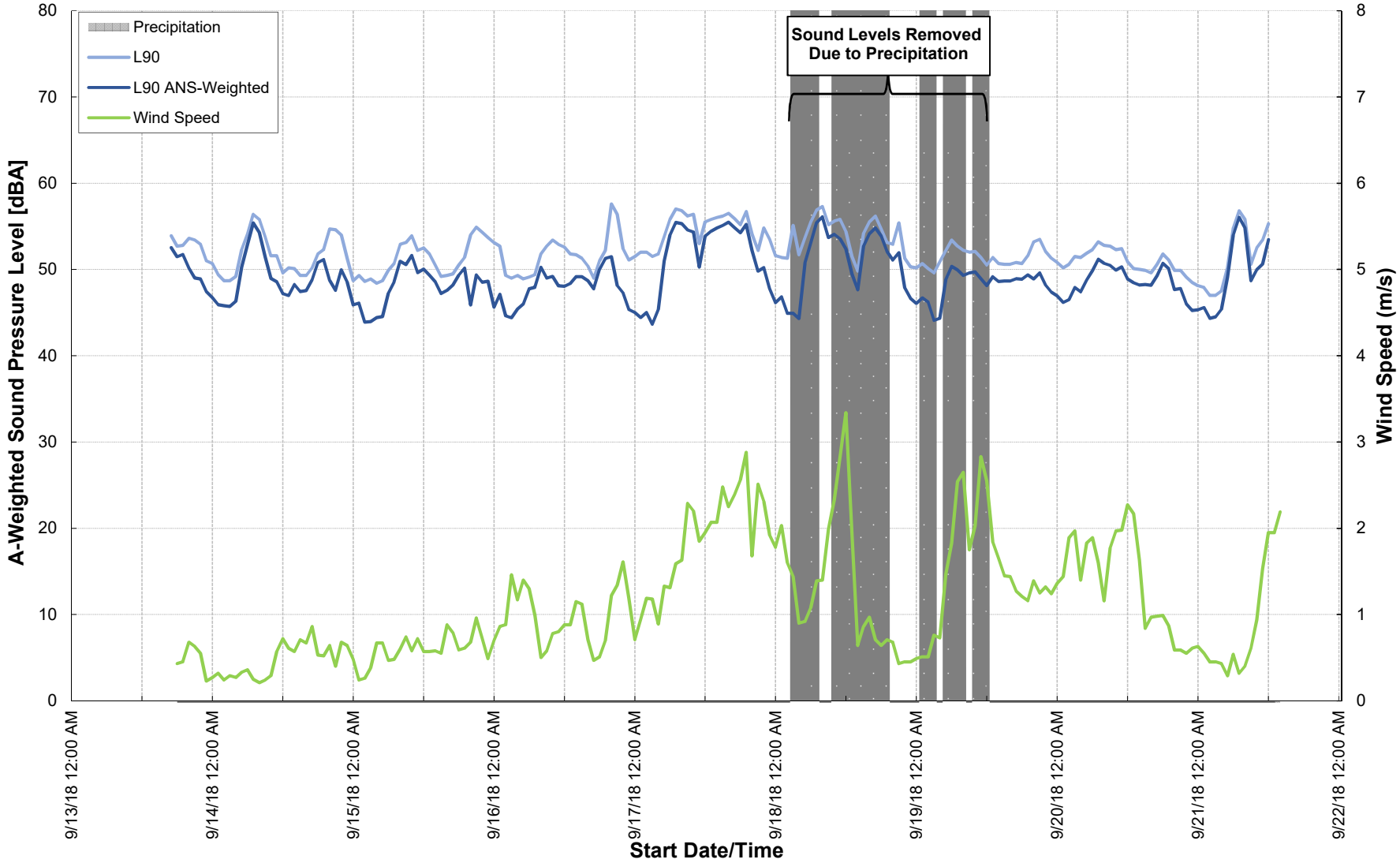


Figure B1-2 - Weymouth Compressor Station Project
Long-Term Hourly L_{90} Sound Pressure Levels- Location M1

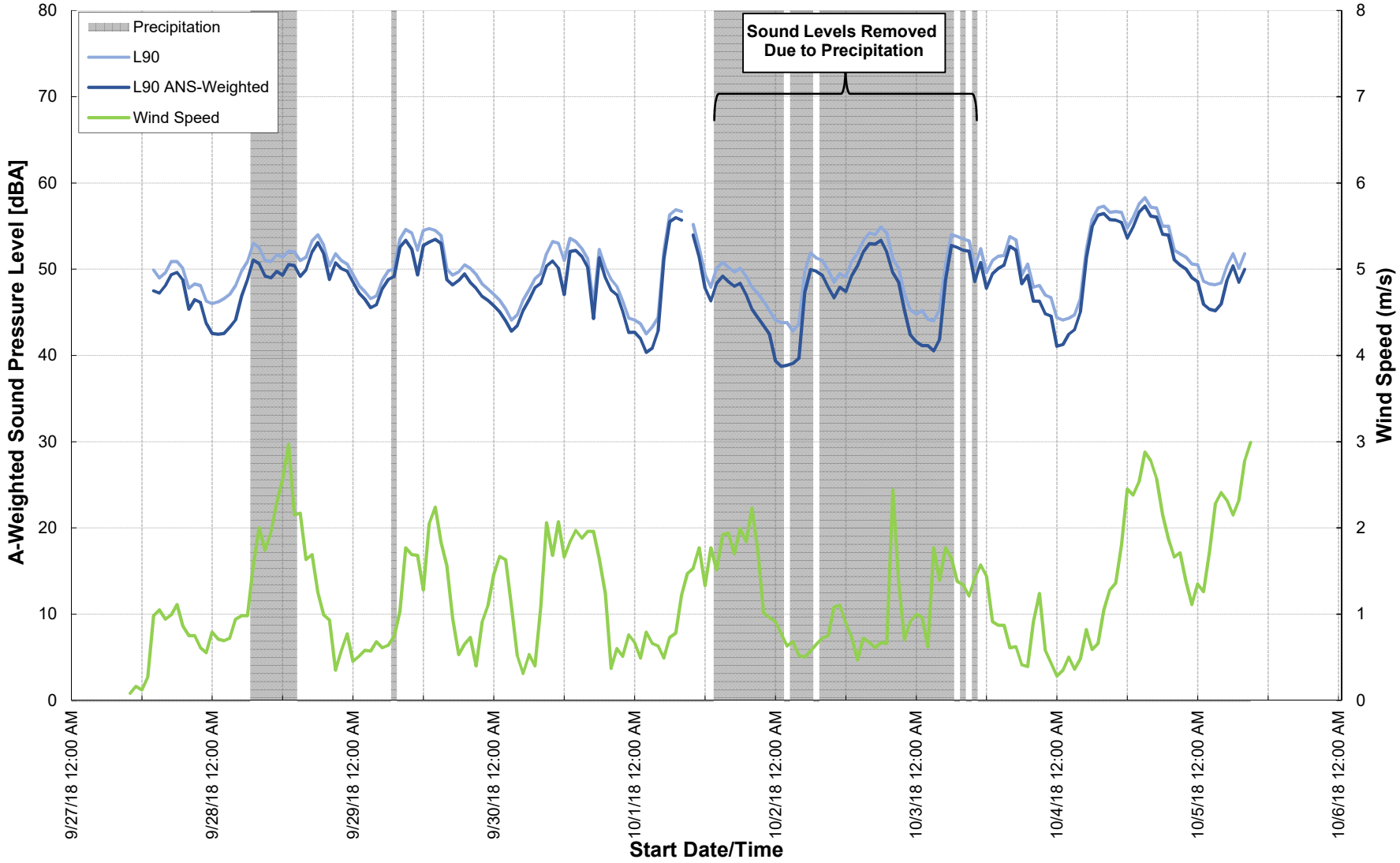


Figure B2-2 - Weymouth Compressor Station Project
Long-Term Hourly L_{90} Sound Pressure Levels- Location M2

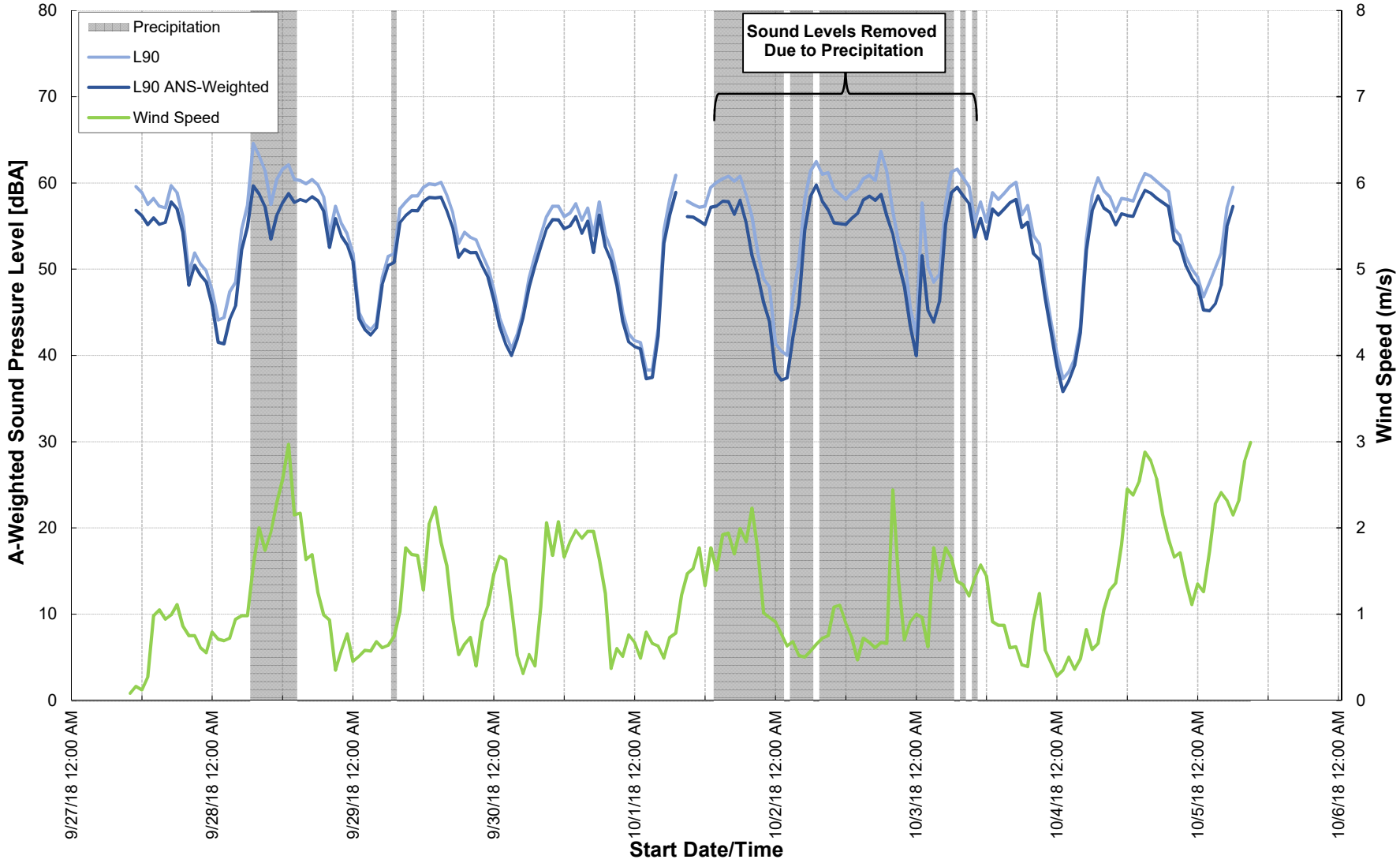


Figure B3-1 - Weymouth Compressor Station Project
Long-Term Hourly L_{90} Sound Pressure Levels- Location M3

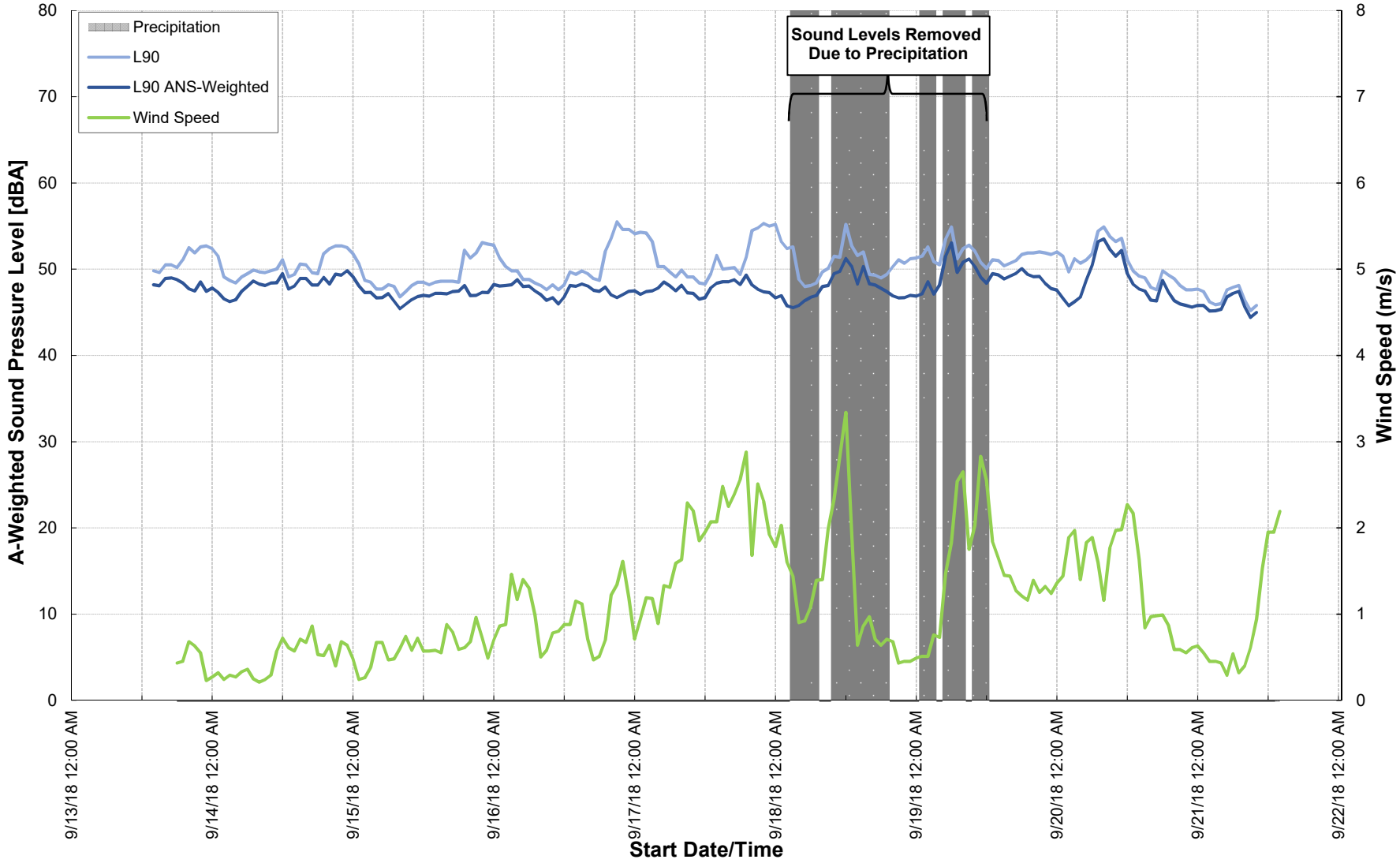


Figure B3-2 - Weymouth Compressor Station Project
Long-Term Hourly L_{90} Sound Pressure Levels- Location M3

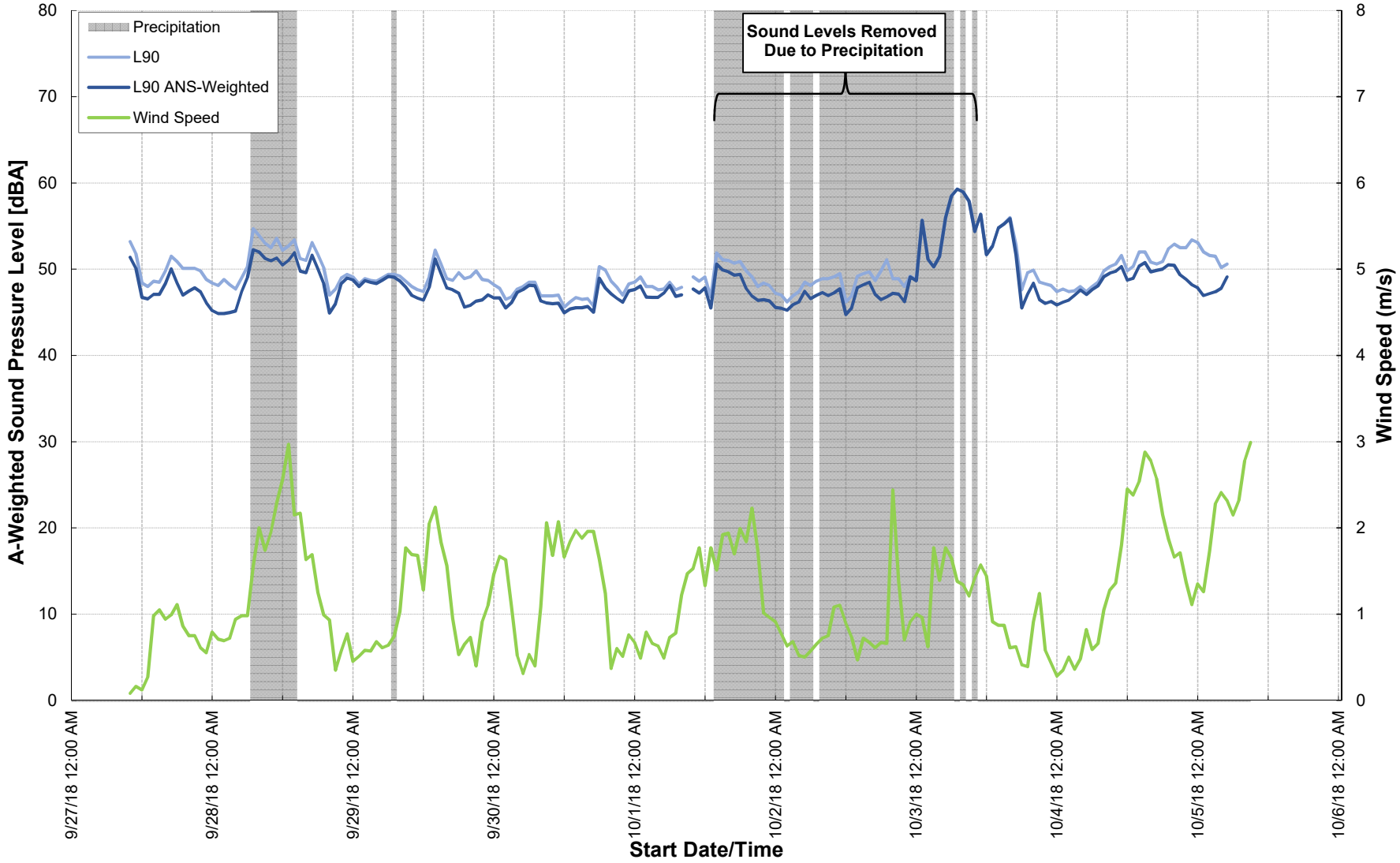


Figure B4-2 - Weymouth Compressor Station Project
Long-Term Hourly L_{90} Sound Pressure Levels- Location M4

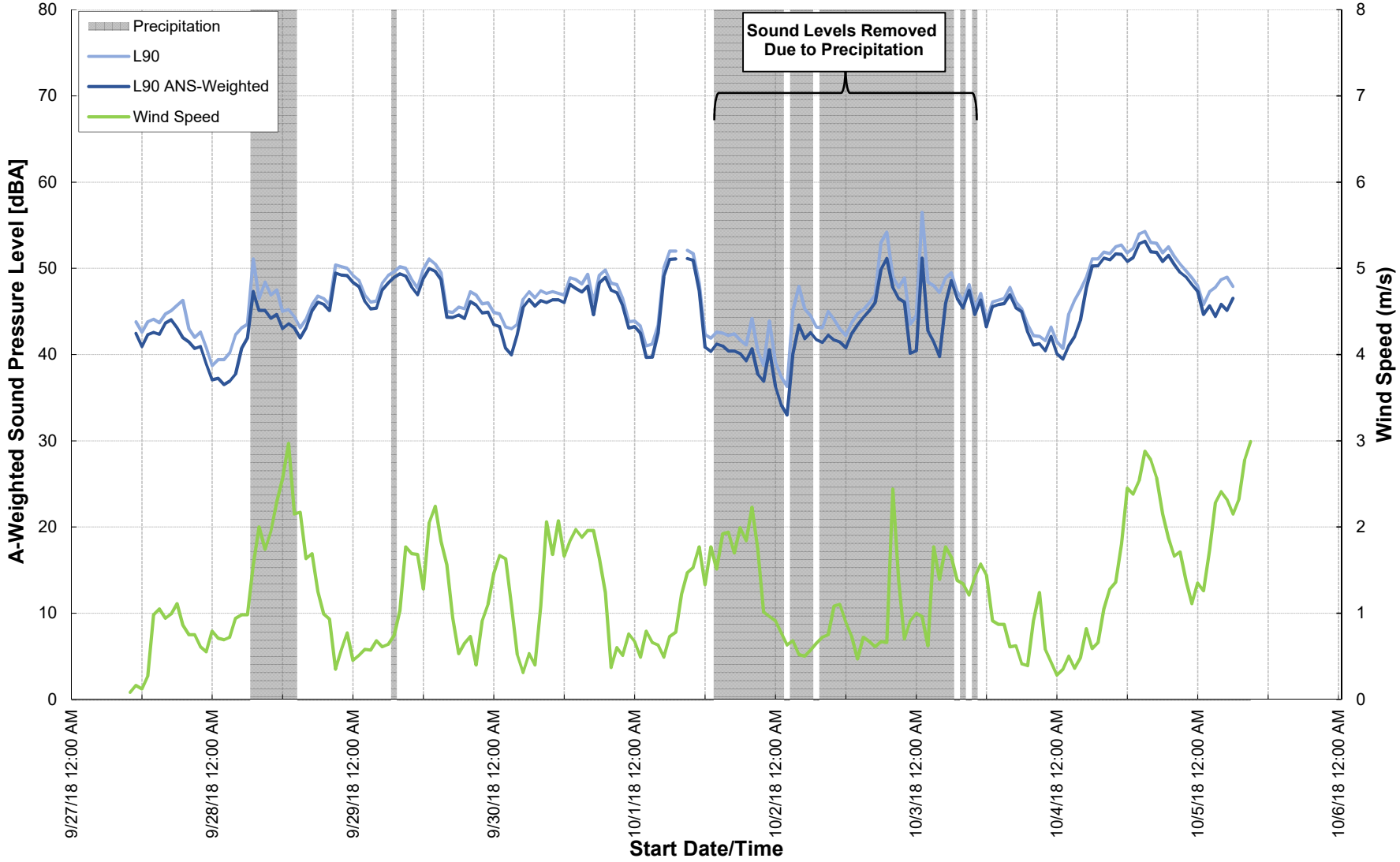


Figure B5-1 - Weymouth Compressor Station Project
Long-Term Hourly L_{90} Sound Pressure Levels- Location M5

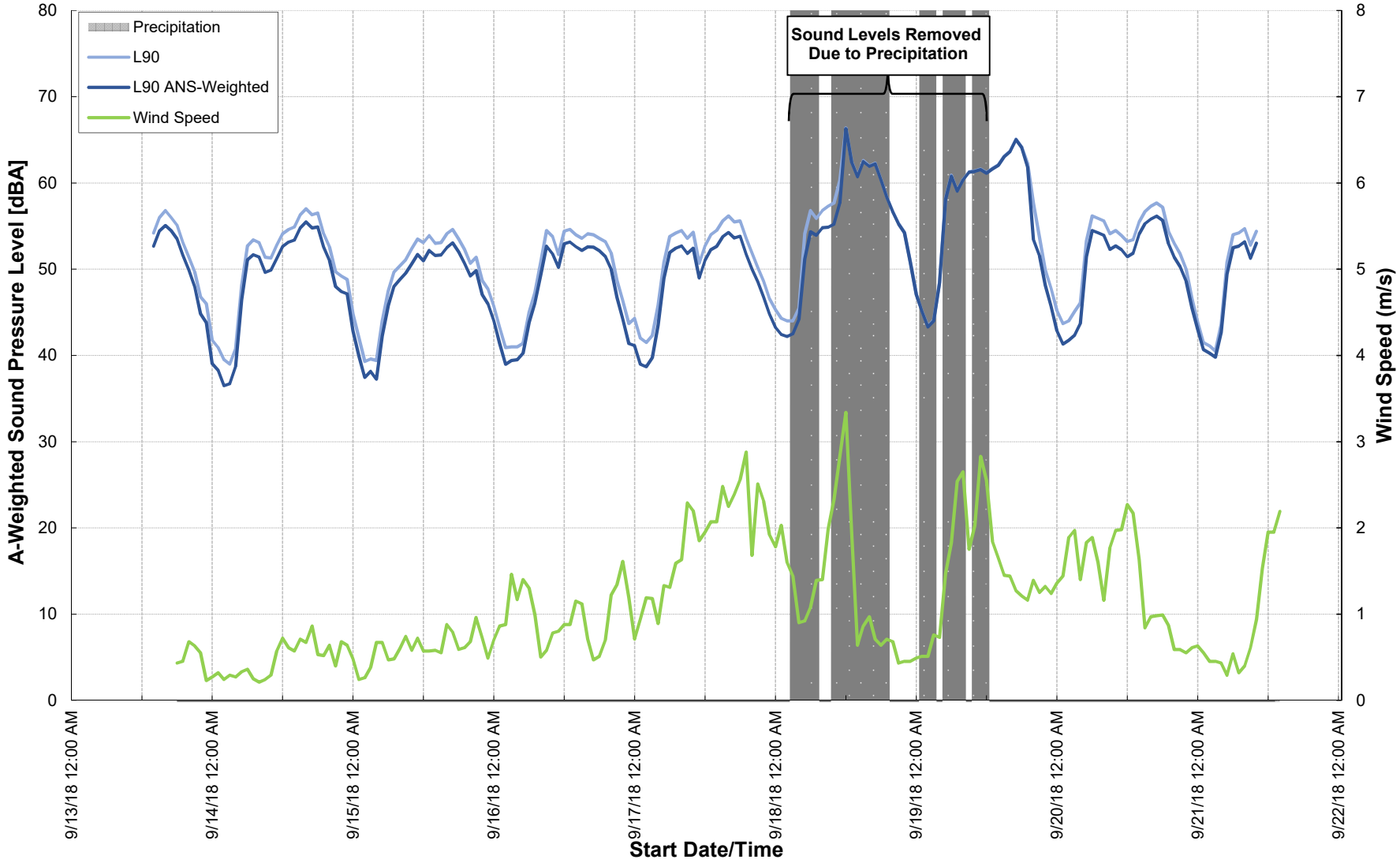


Figure B5-2 - Weymouth Compressor Station Project
Long-Term Hourly L_{90} Sound Pressure Levels- Location M5

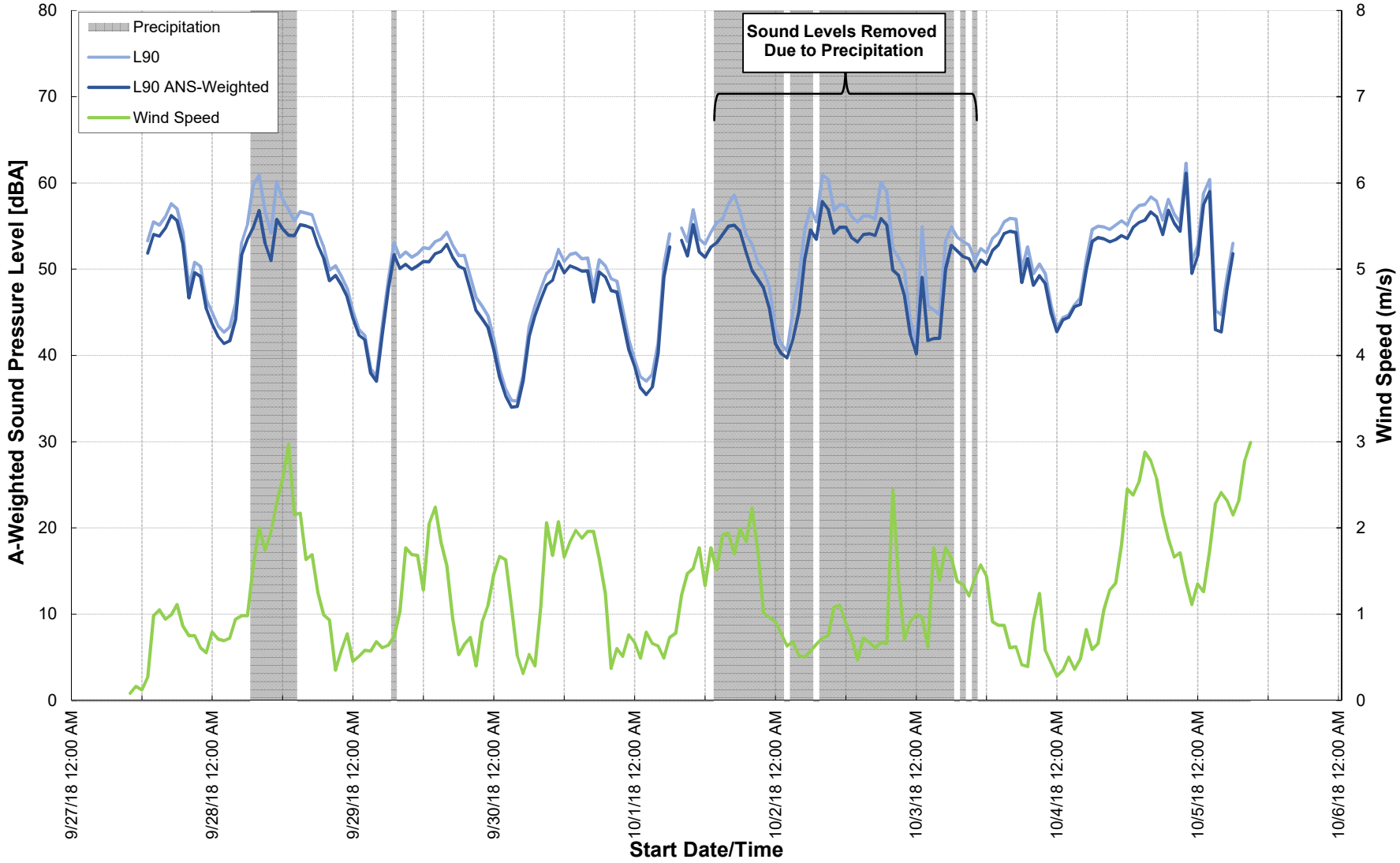


Figure B6-1 - Weymouth Compressor Station Project
Long-Term Hourly L_{90} Sound Pressure Levels- Location M6

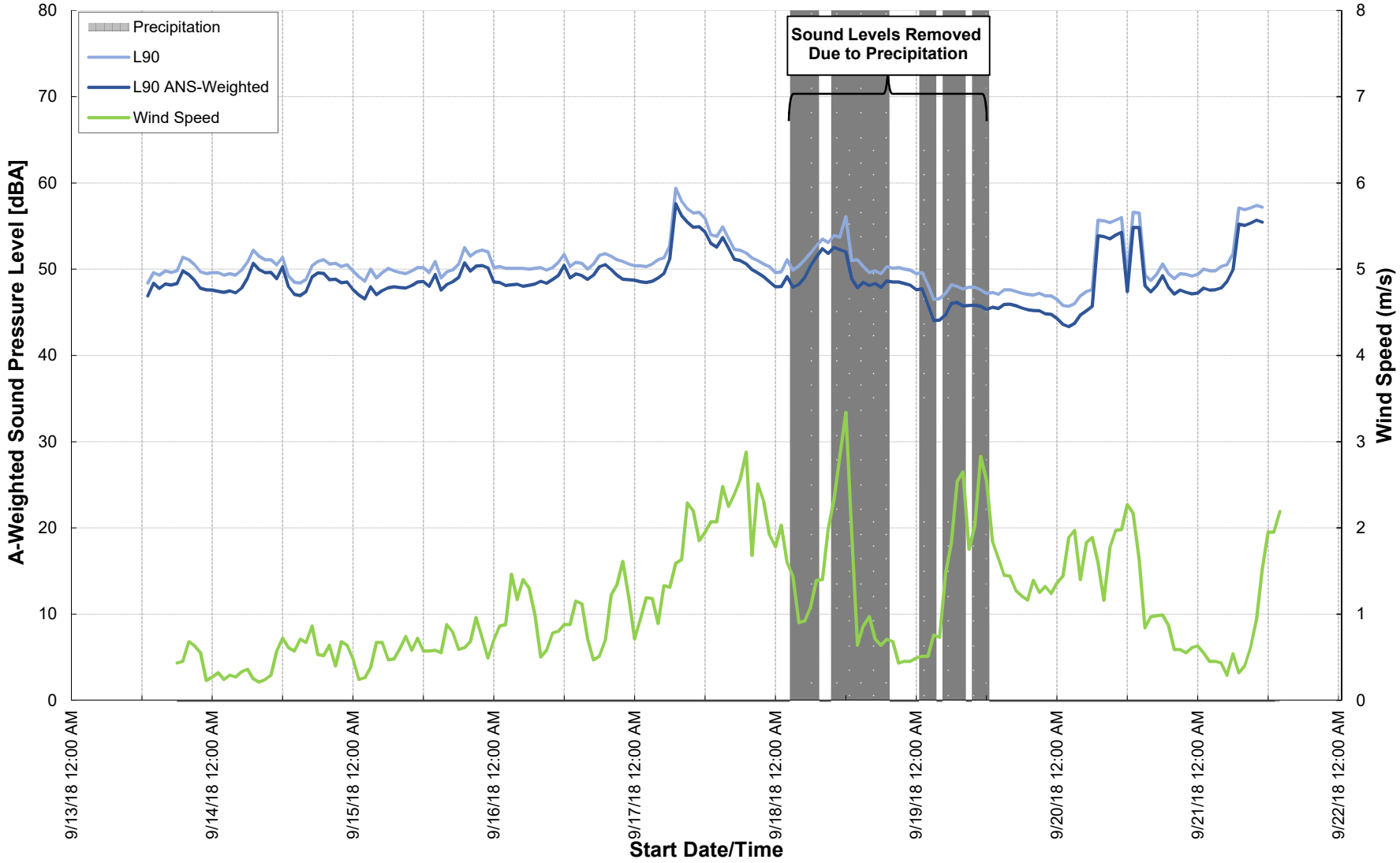
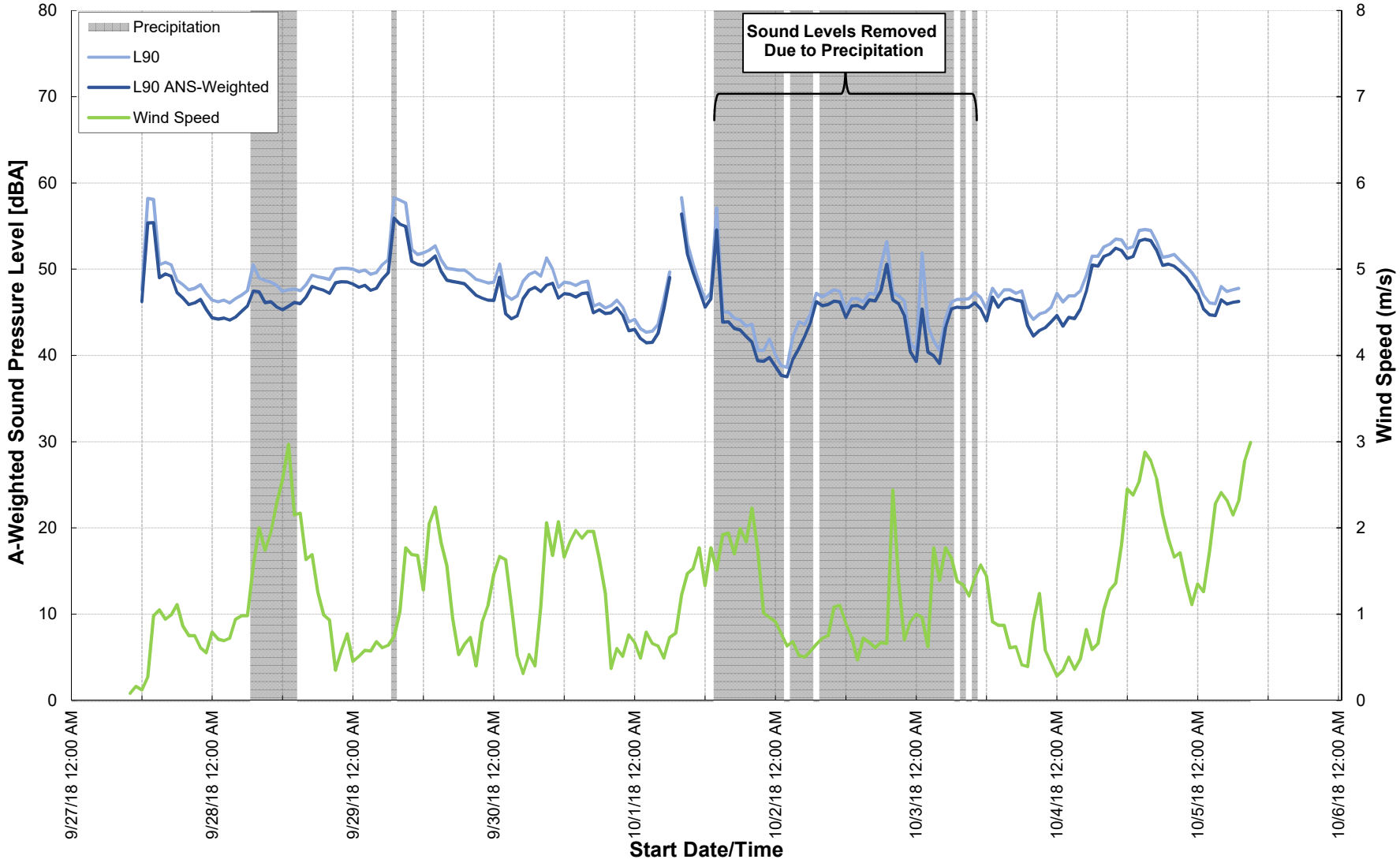


Figure B6-2 - Weymouth Compressor Station Project
Long-Term Hourly L_{90} Sound Pressure Levels- Location M6



Appendix C
Sound Level Instrumentation Calibration Certificates

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.41002

Instrument:	**Acoustical Calibrator**
Model:	**CAL200**
Manufacturer:	**Larson Davis**
Serial number:	**7146**
Class (IEC 60942):	**1**
Barometer type:	
Barometer s/n:	
Customer:	**Epsilon Associates, Inc.**
Tel/Fax:	**978-897-7100 /**

Date Calibrated: **7/5/2018** *Cal Due:* **7/5/2019**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No

Address: **3 Mill & Main Place, Suite 250, Maynard, MA 01754**

Tested in accordance with the following procedures and standards:
Calibration of Acoustical Calibrators, Scantek Inc., Rev. 10/1/2010

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 30, 2017	Scantek, Inc./ NVLAP	Oct 30, 2018
DS-360-SRS	Function Generator	33584	Oct 24, 2017	ACR Env./ A2LA	Oct 24, 2019
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Oct 25, 2017	ACR Env. / A2LA	Oct 25, 2018
HM30-Thommen	Meteo Station	1040170/39633	Oct 25, 2017	ACR Env./ A2LA	Oct 25, 2018
140-Norsonic	Real Time Analyzer	1406423	Oct 31, 2017	Scantek / NVLAP	Oct 31, 2018
PC Program 1018 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
4134-Brüel&Kjær	Microphone	173368	Nov 10, 2017	Scantek, Inc. / NVLAP	Nov 10, 2018
1203-Norsonic	Preamplifier	14059	Feb 12, 2018	Scantek, Inc./ NVLAP	Feb 12, 2019

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK)

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Steven E. Marshall
Signature	Lydon Dawkins	Signature	Steven E Marshall
Date	7/5/2018	Date	7/6/2018

Results summary: Device was tested and complies with following clauses of mentioned specifications:

CLAUSES[1] FROM STANDARDS REFERENCED IN PROCEDURES:	MET[2]	NOT MET	COMMENTS
Manufacturer specifications			
Manufacturer specifications: Sound pressure level	X		
Manufacturer specifications: Frequency	X		
Manufacturer specifications: Total harmonic distortion	X		
Current standards			
ANSI S1.40:2006 B.3 / IEC 60942: 2003 B.2 - Preliminary inspection	X		
ANSI S1.40:2006 B.4.4 / IEC 60942: 2003 B.3.4 - Sound pressure level	X		
ANSI S1.40:2006 A.5.4 / IEC 60942: 2003 A.4.4 - Sound pressure level stability	-	-	
ANSI S1.40:2006 B.4.5 / IEC 60942: 2003 B.3.5 - Frequency	X		
ANSI S1.40:2006 B.4.6 / IEC 60942: 2003 B.3.6 - Total harmonic distortion	X		

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.

[2] The tests marked with (*) are not covered by the current NVLAP accreditation.

Main measured parameters [3]:

Measured[4]/Acceptable[5] Tone frequency (Hz):	Measured[4]/Acceptable[5] Total Harmonic Distortion (%):	Measured [4]/Acceptable Level[5] (dB):
1000.16 ± 1.0/1000.0 ± 10.0	0.36 ± 0.10/ < 3	94.02 ± 0.12/94.0 ± 0.4
1000.11 ± 1.0/1000.0 ± 10.0	0.44 ± 0.10/ < 3	114.00 ± 0.12/114.0 ± 0.4

[3] The stated level is valid at measurement conditions.

[4] The above expanded uncertainties for frequency and distortion are calculated with a coverage factor k=2; for level k=2.00

[5] Acceptable parameters values are from the current standards

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
22.4 ± 1.1	101.00 ± 0.000	56.1 ± 2.1

Tests made with following attachments to instrument:

Calibrator ½" Adaptor Type:
Other:

Adjustments: Unit was not adjusted.
Comments: The instrument was tested and met all specifications found in the referenced procedures.

Note: The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

Measured Data: in Acoustical Calibrator Test Report # 41002 of two pages.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA

Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Calibration Certificate

Certificate Number 2018003831

Customer:
Epsilon Associates Inc
Suite 250
3 Mill and Main Place
Maynard, MA 01754, United States

Model Number	377C20	***Procedure Number***	D0001.8387		
Serial Number	170889	***Technician***	Abraham Ortega		
Test Results	**Pass**	***Calibration Date***	12 Apr 2018		
Initial Condition	As Manufactured	***Calibration Due***	12 Apr 2019		
Description	1/2 inch Microphone - RI - 0V	***Temperature***	24.1	°C	± 0.01 °C
		Humidity	35.6	%RH	± 0.5 %RH
		Static Pressure	101.69	kPa	± 0.03 kPa

Evaluation Method Tested electrically using an electrostatic actuator.

Compliance Standards Compliant to Manufacturer Specifications.

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis Model 2900 Real Time Analyzer	07/17/2017	07/17/2018	001230
Microphone Calibration System	08/30/2017	08/30/2018	001233
1/2" Preamplifier	12/14/2017	12/14/2018	001274
Agilent 34401A DMM	12/07/2017	12/07/2018	001329
Larson Davis CAL250 Acoustic Calibrator	01/03/2018	01/03/2019	003030
1/2" Preamplifier	04/12/2018	04/12/2019	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	09/12/2017	09/12/2018	006507
1/2 inch Microphone - RI - 200V	04/24/2017	04/24/2018	006510
1/2 inch Microphone - RI - 200V	08/09/2017	08/09/2018	006519
Larson Davis 1/2" Preamplifier 7-pin LEMO	09/12/2017	09/12/2018	006530
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/11/2017	08/11/2018	006531

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3822.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Sensitivity

Measurement	Test Result [mV/Pa]	Lower limit [mV/Pa]	Upper limit [mV/Pa]	Expanded Uncertainty [mV/Pa]	Result
Open Circuit Sensitivity	47.33	42.17	59.57	1.10	Pass

-- End of measurement results--

Capacitance

Measurement	Test Result [nF]				
Capacitance	13.00			‡	

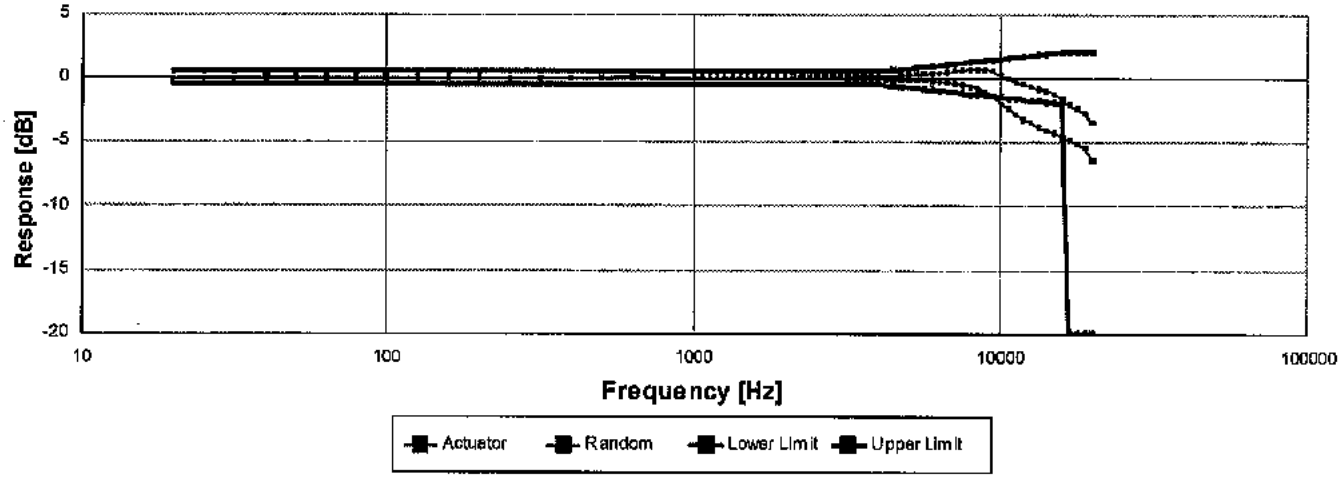
-- End of measurement results--

Lower Limiting Frequency

Measurement	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Result
-3 dB Frequency	1.60	1.00	2.40	Pass ‡

-- End of measurement results--

Frequency Response



Data is normalized for 0 dB @ 251.19 Hz.

Frequency [Hz]	Actuator [dB]	Random [dB]	Lower limit [dB]	Upper limit [dB]	Result
19.95	-0.04	-0.04	-0.50	0.50	Pass ‡
25.12	0.00	0.00	-0.50	0.50	Pass ‡
31.62	0.00	0.00	-0.50	0.50	Pass ‡
39.81	0.02	0.02	-0.50	0.50	Pass ‡
50.12	0.02	0.02	-0.50	0.50	Pass ‡
63.10	0.02	0.02	-0.50	0.50	Pass ‡
79.43	0.02	0.02	-0.50	0.50	Pass ‡
100.00	0.02	0.02	-0.50	0.50	Pass ‡
125.89	0.01	0.01	-0.50	0.50	Pass ‡
158.49	0.01	0.01	-0.50	0.50	Pass ‡
199.53	0.01	0.01	-0.50	0.50	Pass ‡

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Frequency [Hz]	Actuator [dB]	Random [dB]	Lower limit [dB]	Upper limit [dB]	Result
251.19	0.00	0.00	-0.50	0.50	Pass ‡
316.23	0.00	0.00	-0.50	0.50	Pass ‡
398.11	-0.01	0.00	-0.50	0.50	Pass ‡
501.19	-0.01	0.00	-0.50	0.50	Pass ‡
630.96	-0.02	0.16	-0.50	0.50	Pass ‡
794.33	-0.02	0.00	-0.50	0.50	Pass ‡
1,000.00	-0.02	0.00	-0.50	0.50	Pass ‡
1,059.25	-0.03	0.00	-0.50	0.50	Pass ‡
1,122.02	-0.03	0.00	-0.50	0.50	Pass ‡
1,188.50	-0.03	0.00	-0.50	0.50	Pass ‡
1,258.93	-0.03	0.00	-0.50	0.50	Pass ‡
1,333.52	-0.03	0.00	-0.50	0.50	Pass ‡
1,412.54	-0.03	0.00	-0.50	0.50	Pass ‡
1,496.24	-0.03	0.00	-0.50	0.50	Pass ‡
1,584.89	-0.03	0.01	-0.50	0.50	Pass ‡
1,678.80	-0.04	0.00	-0.50	0.50	Pass ‡
1,778.28	-0.04	0.00	-0.50	0.50	Pass ‡
1,883.65	-0.04	0.01	-0.50	0.50	Pass ‡
1,995.26	-0.04	0.01	-0.50	0.50	Pass ‡
2,113.49	-0.05	0.00	-0.50	0.50	Pass ‡
2,238.72	-0.05	0.01	-0.50	0.50	Pass ‡
2,371.37	-0.03	0.03	-0.50	0.50	Pass ‡
2,511.89	-0.03	0.04	-0.50	0.50	Pass ‡
2,660.73	-0.04	0.03	-0.50	0.50	Pass ‡
2,818.38	-0.04	0.04	-0.50	0.50	Pass ‡
2,985.38	-0.05	0.04	-0.50	0.50	Pass ‡
3,162.28	-0.07	0.04	-0.50	0.50	Pass ‡
3,349.65	-0.07	0.05	-0.50	0.50	Pass ‡
3,548.13	-0.07	0.07	-0.50	0.50	Pass ‡
3,758.37	-0.08	0.08	-0.50	0.50	Pass ‡
3,981.07	-0.08	0.11	-0.50	0.50	Pass ‡
4,216.97	-0.12	0.11	-0.63	0.56	Pass ‡
4,466.84	-0.14	0.14	-0.80	0.63	Pass ‡
4,731.51	-0.15	0.18	-0.70	0.69	Pass ‡
5,011.87	-0.17	0.22	-0.80	0.75	Pass ‡
5,308.84	-0.19	0.27	-0.80	0.81	Pass ‡
5,623.41	-0.22	0.32	-0.90	0.88	Pass ‡
5,956.62	-0.25	0.38	-0.90	0.94	Pass ‡
6,309.57	-0.32	0.42	-1.00	1.00	Pass ‡
6,683.44	-0.37	0.49	-1.10	1.06	Pass ‡
7,079.46	-0.44	0.56	-1.10	1.13	Pass ‡
7,498.94	-0.54	0.62	-1.20	1.19	Pass ‡
7,943.28	-0.68	0.65	-1.30	1.25	Pass ‡
8,413.95	-0.85	0.67	-1.30	1.31	Pass ‡
8,912.51	-1.06	0.66	-1.40	1.38	Pass ‡
9,440.61	-1.38	0.54	-1.40	1.43	Pass ‡
10,000.00	-1.96	0.18	-1.50	1.50	Pass ‡
10,592.54	-2.39	-0.04	-1.60	1.56	Pass ‡
11,220.19	-2.89	-0.33	-1.60	1.63	Pass ‡
11,885.02	-3.25	-0.51	-1.70	1.68	Pass ‡
12,589.25	-3.51	-0.61	-1.80	1.75	Pass ‡
13,335.21	-3.88	-0.87	-1.80	1.81	Pass ‡
14,125.38	-4.07	-1.00	-1.90	1.87	Pass ‡

Frequency [Hz]	Actuator [dB]	Random [dB]	Lower limit [dB]	Upper limit [dB]	Result
14,962.36	-4.31	-1.24	-1.93	1.93	Pass ‡
15,848.93	-4.65	-1.64	-2.00	2.00	Pass ‡
16,788.04	-4.85	-2.07		2.00	Pass ‡
17,782.80	-5.17	-2.39		2.00	Pass ‡
18,836.49	-5.48	-2.75		2.00	Pass ‡
19,952.62	-6.40	-3.50		2.00	Pass ‡

-- End of measurement results--

Signatory: *Abraham Ortega*

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3822.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Calibration Certificate

Certificate Number 2018003665

Customer:

Epsilon Associates Inc
Suite 250
3 Mill and Main Place
Maynard, MA 01754, United States

Model Number	831	***Procedure Number***	D0001.8378		
Serial Number	0003044	***Technician***	Ron Harris		
Test Results	**Pass**	***Calibration Date***	10 Apr 2018		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	10 Apr 2019		
		Temperature	23.3	°C	± 0.25 °C
Description	Larson Davis Model 831 Class 1 Sound Level Meter Firmware Revision: 2.314	***Humidity***	51.2	%RH	± 2.0 %RH
		Static Pressure	86.9	kPa	± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRM831 S/N 023824 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 50.0 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61252:2002	ANSI S1.11 (R2009) Class 1
IEC 61260:2001 Class 1	ANSI S1.25 (R2007)
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Correction data from Larson Davis Model 831 Sound Level Meter Manual, I831.01 Rev O, 2016-09-19

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa; Reference Range: 0 dB gain

Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part3.

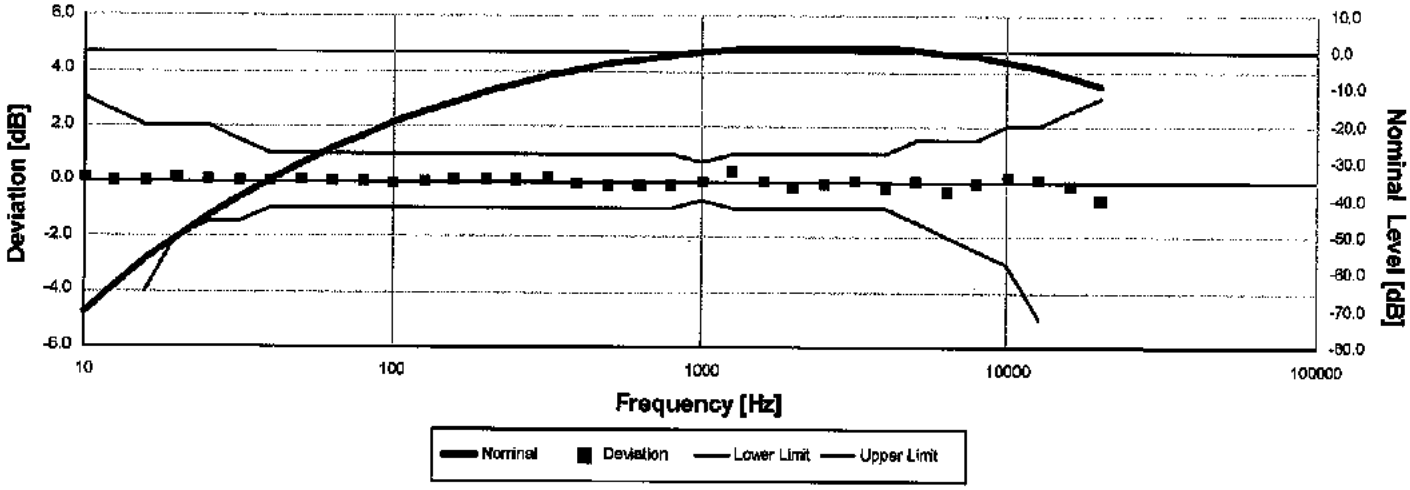
Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 successfully completed by Physikalisch-Technische Bundesanstalt (PTB) on 2016-02-24 certificate number DE-15-M-PTB-0056.

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part 3, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organization responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013 / ANSI/ASA S1.4-2014/Part 2, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1; the sound level meter submitted for testing conforms to the class 1specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Hart Scientific 2626-S Humidity/Temperature Sensor	2017-06-11	2018-06-11	006943
SRS DS360 Ultra Low Distortion Generator	2017-06-29	2018-06-29	007118

A-weight Filter Response

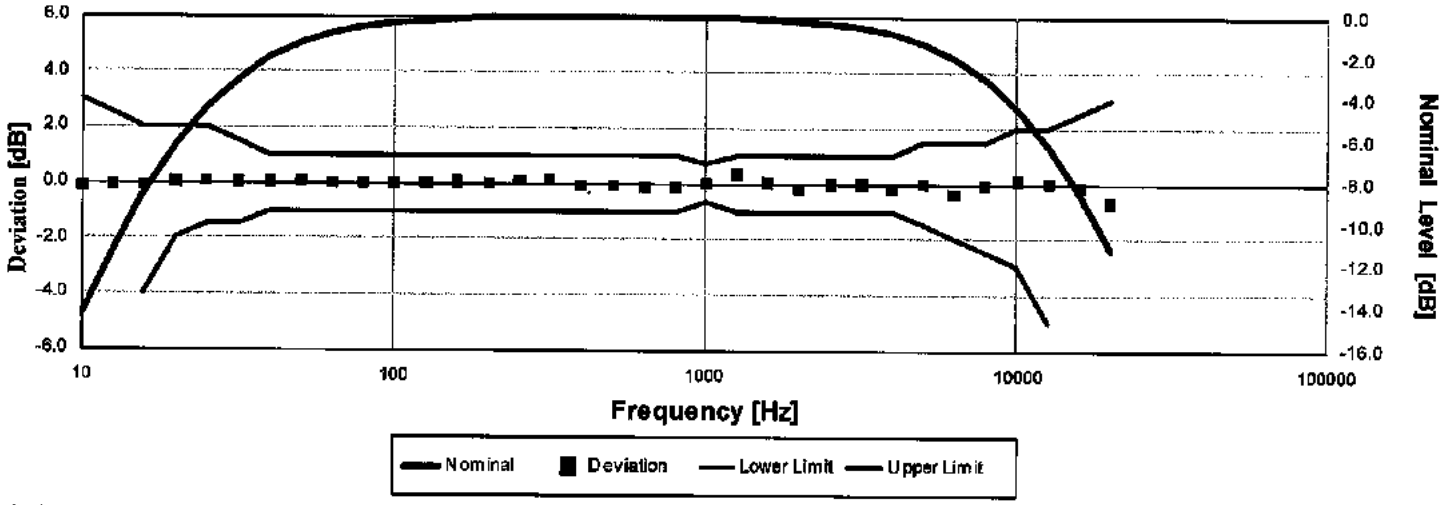


Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
10.00	-70.26	0.14	-inf	3.00	0.22	Pass
12.59	-63.37	0.03	-inf	2.50	0.22	Pass
15.85	-56.69	0.01	-4.00	2.00	0.22	Pass
19.95	-50.37	0.13	-2.00	2.00	0.22	Pass
25.12	-44.63	0.07	-1.50	2.00	0.22	Pass
31.62	-39.38	0.02	-1.50	1.50	0.22	Pass
39.81	-34.59	0.01	-1.00	1.00	0.22	Pass
50.12	-30.14	0.06	-1.00	1.00	0.22	Pass
63.10	-26.17	0.03	-1.00	1.00	0.22	Pass
79.43	-22.47	0.03	-1.00	1.00	0.22	Pass
100.00	-19.17	-0.07	-1.00	1.00	0.22	Pass
125.89	-16.12	-0.02	-1.00	1.00	0.22	Pass
158.49	-13.32	0.08	-1.00	1.00	0.22	Pass
199.53	-10.82	0.08	-1.00	1.00	0.22	Pass
251.19	-8.56	0.04	-1.00	1.00	0.22	Pass
316.23	-6.46	0.14	-1.00	1.00	0.22	Pass
398.11	-4.87	-0.07	-1.00	1.00	0.22	Pass
501.19	-3.33	-0.13	-1.00	1.00	0.22	Pass
630.96	-2.04	-0.14	-1.00	1.00	0.22	Pass
794.33	-0.96	-0.16	-1.00	1.00	0.22	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.22	Pass
1,258.93	0.97	0.37	-1.00	1.00	0.22	Pass
1,584.89	1.01	0.01	-1.00	1.00	0.22	Pass
1,995.26	0.98	-0.22	-1.00	1.00	0.22	Pass
2,511.89	1.25	-0.05	-1.00	1.00	0.22	Pass
3,162.28	1.19	-0.02	-1.00	1.00	0.22	Pass
3,981.07	0.81	-0.19	-1.00	1.00	0.22	Pass
5,011.87	0.54	0.04	-1.50	1.50	0.22	Pass
6,309.57	-0.45	-0.35	-2.00	1.50	0.22	Pass
7,943.28	-1.19	-0.09	-2.50	1.50	0.22	Pass
10,000.00	-2.37	0.13	-3.00	2.00	0.22	Pass
12,589.25	-4.24	0.06	-5.00	2.00	0.22	Pass
15,848.93	-6.73	-0.13	-16.00	2.50	0.22	Pass
19,952.62	-9.93	-0.63	-inf	3.00	0.22	Pass

-- End of measurement results--

C-weight Filter Response

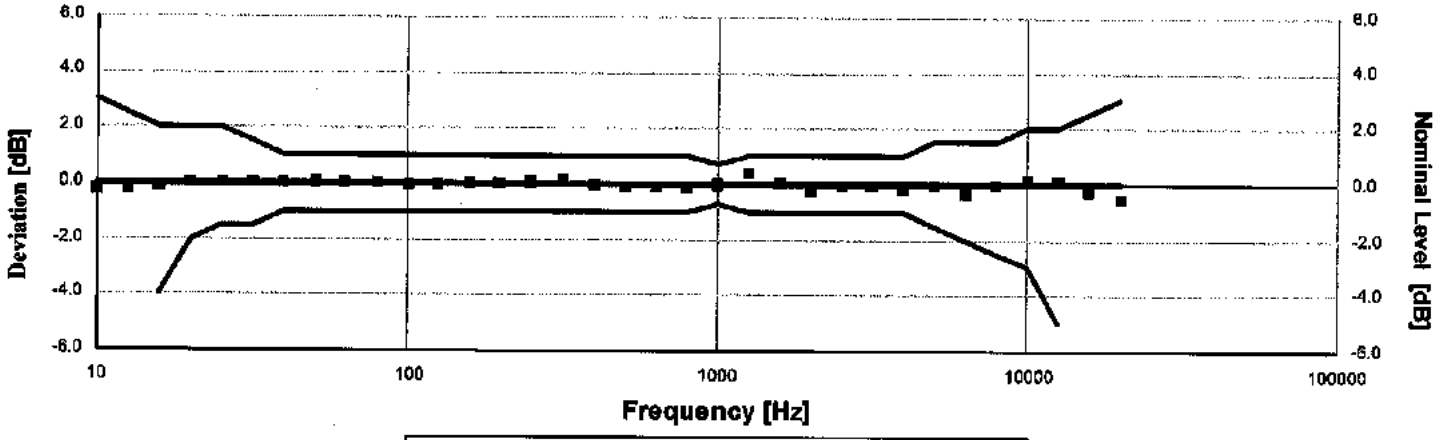


Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
10.00	-14.42	-0.12	-inf	3.00	0.22	Pass
12.59	-11.27	-0.07	-inf	2.50	0.22	Pass
15.85	-8.55	-0.05	-4.00	2.00	0.22	Pass
19.95	-6.16	0.04	-2.00	2.00	0.22	Pass
25.12	-4.34	0.06	-1.50	2.00	0.22	Pass
31.62	-2.95	0.05	-1.50	1.50	0.22	Pass
39.81	-1.96	0.04	-1.00	1.00	0.22	Pass
50.12	-1.22	0.08	-1.00	1.00	0.22	Pass
63.10	-0.79	0.01	-1.00	1.00	0.22	Pass
79.43	-0.47	0.03	-1.00	1.00	0.22	Pass
100.00	-0.31	-0.01	-1.00	1.00	0.22	Pass
125.89	-0.19	0.01	-1.00	1.00	0.22	Pass
158.49	-0.05	0.05	-1.00	1.00	0.22	Pass
199.53	0.01	0.01	-1.00	1.00	0.22	Pass
251.19	0.06	0.06	-1.00	1.00	0.22	Pass
316.23	0.17	0.17	-1.00	1.00	0.22	Pass
398.11	-0.04	-0.04	-1.00	1.00	0.22	Pass
501.19	-0.06	-0.06	-1.00	1.00	0.22	Pass
630.96	-0.11	-0.11	-1.00	1.00	0.22	Pass
794.33	-0.11	-0.11	-1.00	1.00	0.22	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.22	Pass
1,258.93	0.34	0.34	-1.00	1.00	0.22	Pass
1,584.89	-0.05	0.05	-1.00	1.00	0.22	Pass
1,995.26	-0.39	-0.19	-1.00	1.00	0.22	Pass
2,511.89	-0.32	-0.02	-1.00	1.00	0.22	Pass
3,162.28	-0.52	-0.02	-1.00	1.00	0.22	Pass
3,981.07	-0.97	-0.17	-1.00	1.00	0.22	Pass
5,011.87	-1.31	-0.01	-1.50	1.50	0.22	Pass
6,309.57	-2.32	-0.32	-2.00	1.50	0.22	Pass
7,943.28	-3.08	-0.08	-2.50	1.50	0.22	Pass
10,000.00	-4.29	0.11	-3.00	2.00	0.22	Pass
12,589.25	-6.16	0.04	-5.00	2.00	0.22	Pass
15,848.93	-8.65	-0.15	-16.00	2.50	0.22	Pass
19,952.62	-11.86	-0.66	-inf	3.00	0.22	Pass

-- End of measurement results--

Z-weight Filter Response



Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
10.00	-0.21	-0.21	-inf	3.00	0.22	Pass
12.59	-0.18	-0.18	-inf	2.50	0.22	Pass
15.85	-0.11	-0.11	-4.00	2.00	0.22	Pass
19.95	0.01	0.01	-2.00	2.00	0.22	Pass
25.12	0.01	0.01	-1.50	2.00	0.22	Pass
31.62	0.01	0.01	-1.50	1.50	0.22	Pass
39.81	0.01	0.01	-1.00	1.00	0.22	Pass
50.12	0.07	0.07	-1.00	1.00	0.22	Pass
63.10	0.01	0.01	-1.00	1.00	0.22	Pass
79.43	0.03	0.03	-1.00	1.00	0.22	Pass
100.00	-0.03	-0.03	-1.00	1.00	0.22	Pass
125.89	-0.03	-0.03	-1.00	1.00	0.22	Pass
158.49	0.03	0.03	-1.00	1.00	0.22	Pass
199.53	0.04	0.04	-1.00	1.00	0.22	Pass
251.19	0.07	0.07	-1.00	1.00	0.22	Pass
316.23	0.15	0.15	-1.00	1.00	0.22	Pass
398.11	-0.07	-0.07	-1.00	1.00	0.22	Pass
501.19	-0.10	-0.10	-1.00	1.00	0.22	Pass
630.96	-0.14	-0.14	-1.00	1.00	0.22	Pass
794.33	-0.13	-0.13	-1.00	1.00	0.22	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.22	Pass
1,258.93	0.37	0.37	-1.00	1.00	0.22	Pass
1,584.89	0.03	0.03	-1.00	1.00	0.22	Pass
1,995.26	-0.23	-0.23	-1.00	1.00	0.22	Pass
2,511.89	-0.03	-0.03	-1.00	1.00	0.22	Pass
3,162.28	-0.03	-0.03	-1.00	1.00	0.22	Pass
3,981.07	-0.17	-0.17	-1.00	1.00	0.22	Pass
5,011.87	-0.03	-0.03	-1.50	1.50	0.22	Pass
6,309.57	-0.33	-0.33	-2.00	1.50	0.22	Pass
7,943.28	-0.04	-0.04	-2.50	1.50	0.22	Pass
10,000.00	0.18	0.18	-3.00	2.00	0.22	Pass
12,589.25	0.08	0.08	-5.00	2.00	0.22	Pass
15,848.93	-0.26	-0.26	-16.00	2.50	0.22	Pass
19,952.62	-0.53	-0.53	-inf	3.00	0.22	Pass

-- End of measurement results--

High Level Stability

Electrical signal test of high level stability performed according to IEC 61672-3:2013 21 and ANSI S1.4-2014 Part 3: 21 for compliance to IEC 61672-1:2013 5.15 and ANSI S1.4-2014 Part 1: 5.15

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
High Level Stability	0.00	-0.10	0.10	0.01	Pass

-- End of measurement results--

Long-Term Stability

Electrical signal test of long term stability performed according to IEC 61672-3:2013 15 and ANSI S1.4-2014 Part 3: 15 for compliance to ISC 61672-1:2013 5.14 and ANSI S1.4-2014 Part 1: 5.14

Test Duration [min]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
36	0.00	-0.10	0.10	0.01	Pass

-- End of measurement results--

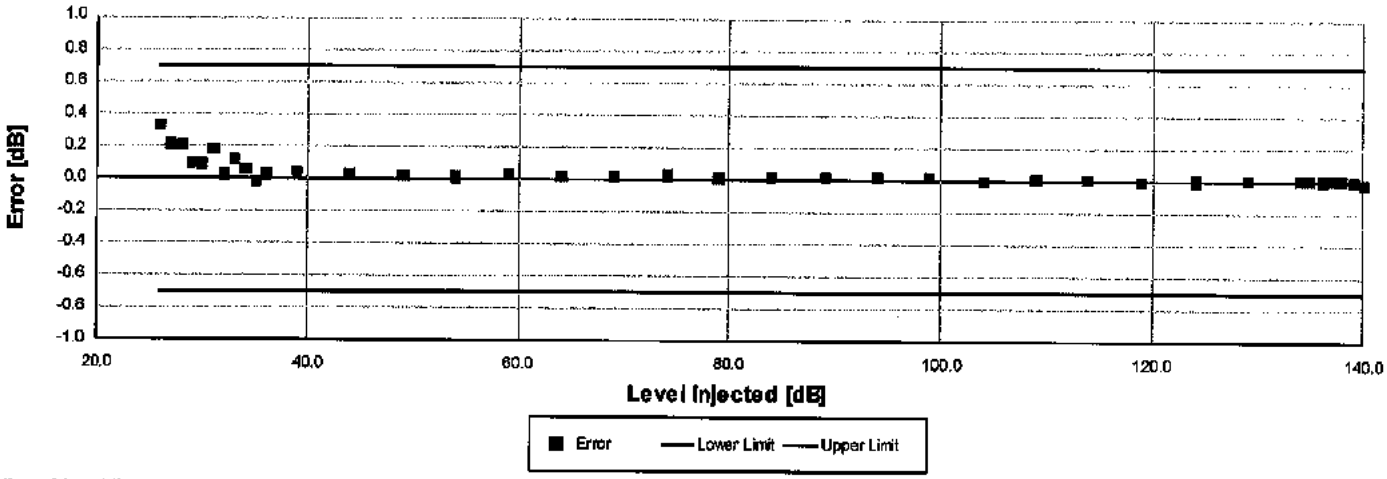
1 kHz Reference Levels

Frequency weightings and time weightings at 1 kHz (reference is A weighted Fast) performed according to IEC 61672-3:2013 14 and ANSI S1.4-2014 Part 3: 14 for compliance to IEC 61672-1:2013 5.5.9 and 5.8.3 and ANSI S1.4-2014 Part 1: 5.5.9 and 5.8.3

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
C weight	114.00	113.80	114.20	0.09	Pass
Z weight	113.99	113.80	114.20	0.09	Pass
Slow	114.00	113.90	114.10	0.09	Pass
Impulse	114.00	113.90	114.10	0.09	Pass

-- End of measurement results--

A-weighted 0 dB Gain Broadband Log Linearity: 8,000.00 Hz



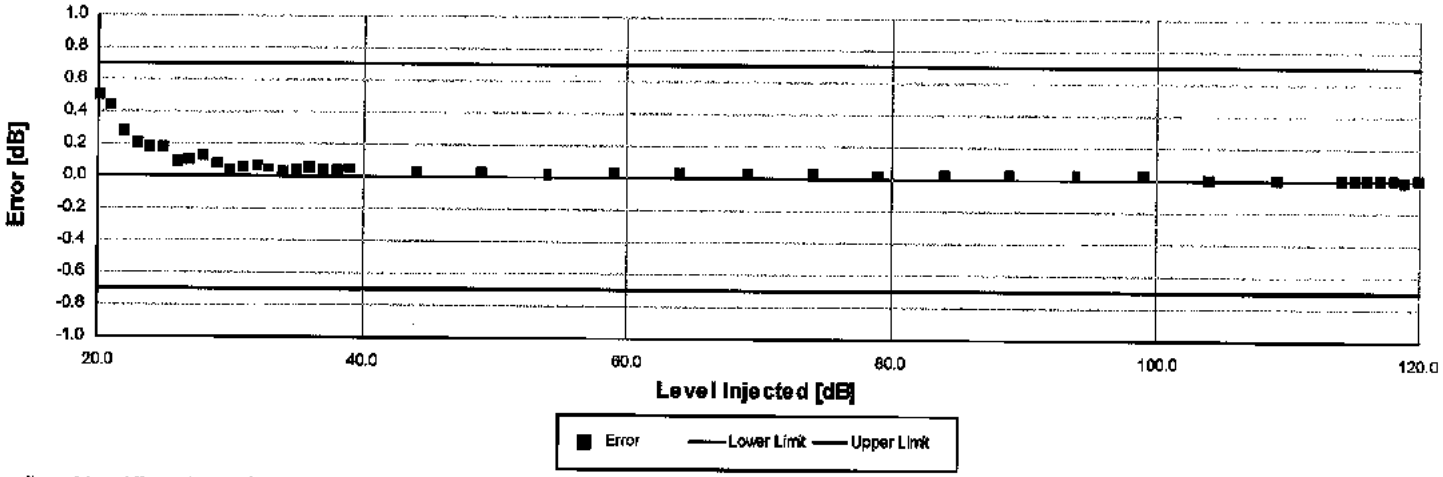
Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6, IEC 60804:2000 6.2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6.9, ANSI S1.4-2014 Part 1: 5.6, ANSI S1.43 (R2007) 6.2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
26.00	0.33	-0.70	0.70	0.09	Pass
27.00	0.21	-0.70	0.70	0.09	Pass
28.00	0.21	-0.70	0.70	0.09	Pass
29.00	0.10	-0.70	0.70	0.09	Pass
30.00	0.09	-0.70	0.70	0.09	Pass
31.00	0.18	-0.70	0.70	0.09	Pass
32.00	0.02	-0.70	0.70	0.09	Pass
33.00	0.12	-0.70	0.70	0.09	Pass
34.00	0.05	-0.70	0.70	0.09	Pass
35.00	-0.02	-0.70	0.70	0.09	Pass
36.00	0.02	-0.70	0.70	0.09	Pass
39.00	0.04	-0.70	0.70	0.09	Pass
44.00	0.02	-0.70	0.70	0.09	Pass
49.00	0.02	-0.70	0.70	0.09	Pass
54.00	0.01	-0.70	0.70	0.09	Pass
59.00	0.03	-0.70	0.70	0.09	Pass
64.00	0.02	-0.70	0.70	0.09	Pass
69.00	0.02	-0.70	0.70	0.09	Pass
74.00	0.02	-0.70	0.70	0.09	Pass
79.00	0.01	-0.70	0.70	0.09	Pass
84.00	0.02	-0.70	0.70	0.09	Pass
89.00	0.02	-0.70	0.70	0.09	Pass
94.00	0.02	-0.70	0.70	0.09	Pass
99.00	0.02	-0.70	0.70	0.09	Pass
104.00	0.00	-0.70	0.70	0.09	Pass
109.00	0.00	-0.70	0.70	0.09	Pass
114.00	0.00	-0.70	0.70	0.09	Pass
119.00	-0.01	-0.70	0.70	0.09	Pass
124.00	0.00	-0.70	0.70	0.09	Pass
129.00	0.00	-0.70	0.70	0.09	Pass
134.00	0.00	-0.70	0.70	0.09	Pass
135.00	0.00	-0.70	0.70	0.09	Pass
136.00	0.00	-0.70	0.70	0.09	Pass
137.00	0.00	-0.70	0.70	0.09	Pass
138.00	0.00	-0.70	0.70	0.09	Pass
139.00	-0.01	-0.70	0.70	0.09	Pass

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140.00	-0.02	-0.70	0.70	0.09	Pass

-- End of measurement results--

A-weighted 20 dB Gain Broadband Log Linearity: 8,000.00 Hz



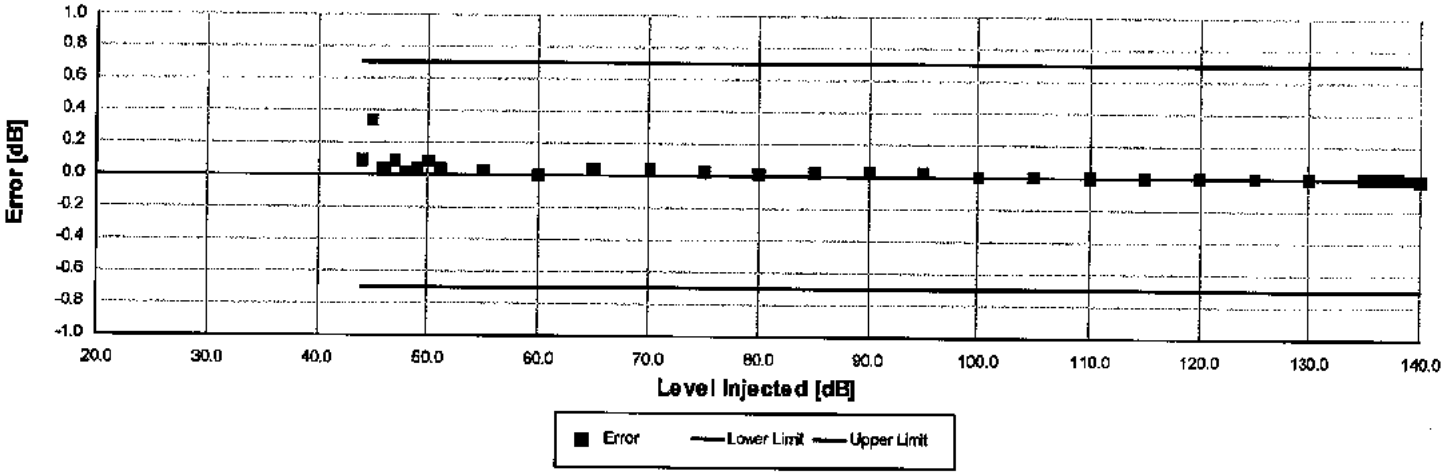
Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6, IEC 60804:2000 6.2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6.9, ANSI S1.4-2014 Part 1: 5.6, ANSI S1.43 (R2007) 6.2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
20.00	0.50	-0.70	0.70	0.09	Pass
21.00	0.44	-0.70	0.70	0.09	Pass
22.00	0.28	-0.70	0.70	0.09	Pass
23.00	0.20	-0.70	0.70	0.09	Pass
24.00	0.18	-0.70	0.70	0.09	Pass
25.00	0.18	-0.70	0.70	0.09	Pass
26.00	0.10	-0.70	0.70	0.09	Pass
27.00	0.10	-0.70	0.70	0.09	Pass
28.00	0.12	-0.70	0.70	0.09	Pass
29.00	0.08	-0.70	0.70	0.09	Pass
30.00	0.04	-0.70	0.70	0.09	Pass
31.00	0.05	-0.70	0.70	0.09	Pass
32.00	0.06	-0.70	0.70	0.09	Pass
33.00	0.05	-0.70	0.70	0.09	Pass
34.00	0.03	-0.70	0.70	0.09	Pass
35.00	0.04	-0.70	0.70	0.09	Pass
36.00	0.06	-0.70	0.70	0.09	Pass
37.00	0.04	-0.70	0.70	0.09	Pass
38.00	0.05	-0.70	0.70	0.09	Pass
39.00	0.05	-0.70	0.70	0.09	Pass
44.00	0.03	-0.70	0.70	0.09	Pass
49.00	0.03	-0.70	0.70	0.09	Pass
54.00	0.02	-0.70	0.70	0.09	Pass
59.00	0.03	-0.70	0.70	0.09	Pass
64.00	0.03	-0.70	0.70	0.09	Pass
69.00	0.03	-0.70	0.70	0.09	Pass
74.00	0.03	-0.70	0.70	0.09	Pass
79.00	0.02	-0.70	0.70	0.09	Pass
84.00	0.02	-0.70	0.70	0.09	Pass
89.00	0.03	-0.70	0.70	0.09	Pass
94.00	0.03	-0.70	0.70	0.09	Pass
99.00	0.03	-0.70	0.70	0.09	Pass
104.00	0.01	-0.70	0.70	0.09	Pass
109.00	0.01	-0.70	0.70	0.09	Pass
114.00	0.00	-0.70	0.70	0.09	Pass
115.00	0.01	-0.70	0.70	0.09	Pass

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
116.00	0.00	-0.70	0.70	0.09	Pass
117.00	0.01	-0.70	0.70	0.09	Pass
118.00	0.01	-0.70	0.70	0.09	Pass
119.00	-0.01	-0.70	0.70	0.09	Pass
120.00	0.00	-0.70	0.70	0.09	Pass

-- End of measurement results--

1/1 Octave Log Linearity: 1,000.00 Hz

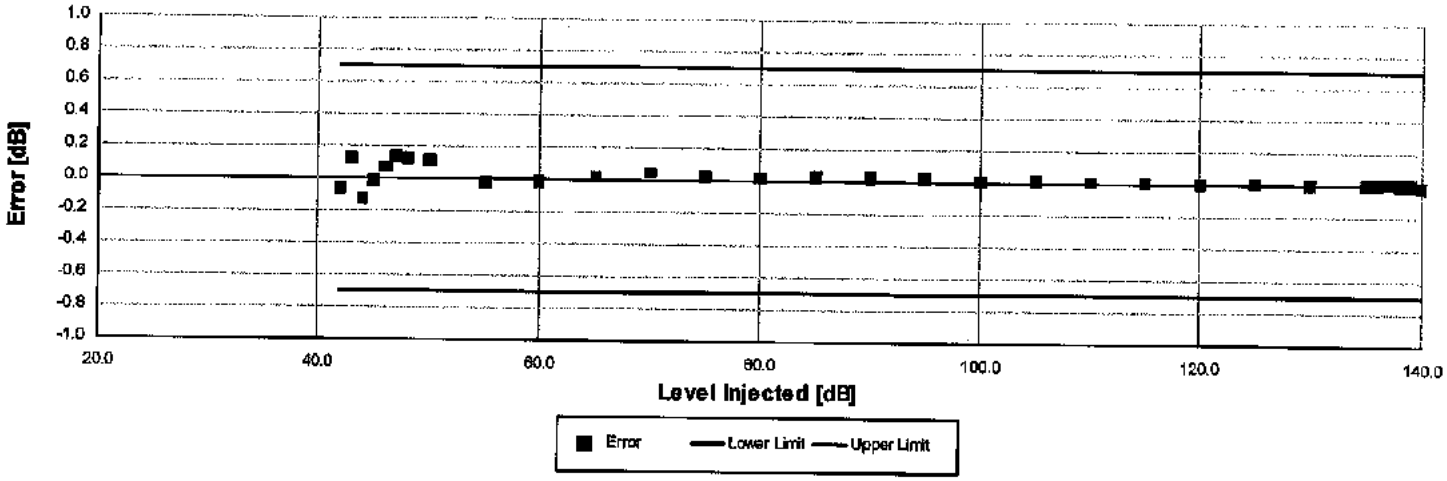


1/1 octave level linearity at normal range with 0 dB gain performed according to IEC 61260:2001 4.6, ANSI S.11 (R2009) 4.6

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
44.00	0.09	-0.70	0.70	0.09	Pass
45.00	0.34	-0.70	0.70	0.09	Pass
46.00	0.04	-0.70	0.70	0.09	Pass
47.00	0.09	-0.70	0.70	0.10	Pass
48.00	0.02	-0.70	0.70	0.10	Pass
49.00	0.04	-0.70	0.70	0.10	Pass
50.00	0.08	-0.70	0.70	0.09	Pass
51.00	0.04	-0.70	0.70	0.09	Pass
55.00	0.03	-0.70	0.70	0.09	Pass
60.00	0.00	-0.70	0.70	0.09	Pass
65.00	0.03	-0.70	0.70	0.09	Pass
70.00	0.04	-0.70	0.70	0.09	Pass
75.00	0.02	-0.70	0.70	0.09	Pass
80.00	0.01	-0.70	0.70	0.09	Pass
85.00	0.02	-0.70	0.70	0.09	Pass
90.00	0.02	-0.70	0.70	0.09	Pass
95.00	0.02	-0.70	0.70	0.09	Pass
100.00	0.00	-0.70	0.70	0.09	Pass
105.00	0.01	-0.70	0.70	0.09	Pass
110.00	0.00	-0.70	0.70	0.09	Pass
115.00	0.00	-0.70	0.70	0.09	Pass
120.00	0.00	-0.70	0.70	0.09	Pass
125.00	0.00	-0.70	0.70	0.09	Pass
130.00	0.00	-0.70	0.70	0.09	Pass
135.00	0.00	-0.70	0.70	0.09	Pass
136.00	0.00	-0.70	0.70	0.09	Pass
137.00	0.00	-0.70	0.70	0.09	Pass
138.00	0.00	-0.70	0.70	0.09	Pass
139.00	-0.01	-0.70	0.70	0.09	Pass
140.00	-0.02	-0.70	0.70	0.09	Pass

-- End of measurement results--

1/3 Octave Log Linearity: 1,000.00 Hz



1/3 octave level linearity at normal range with 0 dB gain performed according to IEC 61260:2001 4.6, ANSI S.11 (R2009) 4.6

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
42.00	-0.07	-0.70	0.70	0.09	Pass
43.00	0.12	-0.70	0.70	0.10	Pass
44.00	-0.13	-0.70	0.70	0.10	Pass
45.00	-0.01	-0.70	0.70	0.10	Pass
46.00	0.07	-0.70	0.70	0.09	Pass
47.00	0.13	-0.70	0.70	0.09	Pass
48.00	0.12	-0.70	0.70	0.09	Pass
50.00	0.11	-0.70	0.70	0.09	Pass
55.00	-0.03	-0.70	0.70	0.09	Pass
60.00	-0.02	-0.70	0.70	0.09	Pass
65.00	0.01	-0.70	0.70	0.09	Pass
70.00	0.04	-0.70	0.70	0.09	Pass
75.00	0.02	-0.70	0.70	0.09	Pass
80.00	0.02	-0.70	0.70	0.09	Pass
85.00	0.03	-0.70	0.70	0.09	Pass
90.00	0.02	-0.70	0.70	0.09	Pass
95.00	0.02	-0.70	0.70	0.09	Pass
100.00	0.01	-0.70	0.70	0.09	Pass
105.00	0.01	-0.70	0.70	0.09	Pass
110.00	0.00	-0.70	0.70	0.09	Pass
115.00	0.00	-0.70	0.70	0.09	Pass
120.00	0.00	-0.70	0.70	0.09	Pass
125.00	0.00	-0.70	0.70	0.09	Pass
130.00	0.00	-0.70	0.70	0.09	Pass
135.00	0.00	-0.70	0.70	0.09	Pass
136.00	0.00	-0.70	0.70	0.09	Pass
137.00	0.00	-0.70	0.70	0.09	Pass
138.00	0.00	-0.70	0.70	0.09	Pass
139.00	-0.01	-0.70	0.70	0.09	Pass
140.00	-0.02	-0.70	0.70	0.09	Pass

-- End of measurement results--

Slow Detector

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200	-7.54	-7.92	-6.92	0.09	Pass
	2	-27.16	-29.99	-25.99	0.09	Pass

-- End of measurement results--

Fast Detector

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200.00	-1.03	-1.48	-0.48	0.09	Pass
	2.00	-18.27	-19.49	-16.99	0.09	Pass
	0.25	-27.30	-29.99	-25.99	0.09	Pass

-- End of measurement results--

Sound Exposure Level

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200.00	-7.01	-7.49	-6.49	0.09	Pass
	2.00	-27.03	-28.49	-25.99	0.09	Pass
	0.25	-36.14	-39.02	-35.02	0.09	Pass

-- End of measurement results--

Peak C-weight

C-weighted peak sound level performed according to IEC 61672-3:2013 19 and ANSI S1.4-2014 Part 3: 19 for compliance to IEC 61672-1:2013 5.13 and ANSI S1.4-2014 Part 1: 5.13

Level [dB]	Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
135.00	31.50	138.21	135.50	139.50	0.09	Pass
135.00	500.00	138.57	137.50	139.50	0.09	Pass
135.00	8,000.00	137.63	136.40	140.40	0.10	Pass
135.00, Negative	500.00	137.17	136.40	138.40	0.09	Pass
135.00, Positive	500.00	137.17	136.40	138.40	0.09	Pass

-- End of measurement results--

Peak Z-weight

Z-weighted peak sound level performed according to IEC 60651:2001 9.4.4 and ANSI S1.4:1983 (R2006) 8.4.4

Amplitude [dB]	Duration [µs]		Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
136.00	100	Negative Pulse	136.36	134.01	138.01	0.09	Pass
	100	Positive Pulse	136.36	134.01	138.01	0.09	Pass
126.00	100	Negative Pulse	126.35	124.00	128.00	0.09	Pass
	100	Positive Pulse	126.36	124.00	128.00	0.09	Pass
116.00	100	Negative Pulse	116.36	114.00	118.00	0.09	Pass
	100	Positive Pulse	116.36	114.00	118.00	0.09	Pass
106.00	100	Negative Pulse	106.33	103.98	107.98	0.09	Pass
	100	Positive Pulse	106.33	103.99	107.99	0.09	Pass

-- End of measurement results--

Overload Detector

Overload indication performed according to IEC 61672-3:2013 20 and ANSI S1.4-2014 Part 3: 20 for compliance to IEC 61672-1:2013 5.11, IEC 60804:2000 9.3.5, IEC 61252:2002 11, ANSI S1.4 (R2006) 5.8, and ANSI S1.4-2014 Part 1: 5.11, ANSI S1.25 (R2007) 7.6, ANSI S1.43 (R2007) 7

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
Positive	141.00	140.00	142.00	0.09	Pass
Negative	140.80	140.00	142.00	0.09	Pass
Difference	0.20	-1.50	1.50	0.10	Pass

-- End of measurement results--

Peak Rise Time

Peak rise time performed according to IEC 60651:2001 9.4.4 and ANSI S1.4:1983 (R2006) 8.4.4

Amplitude [dB]	Duration [µs]		Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
139.00	40	Negative Pulse	138.52	137.00	139.00	0.09	Pass
		Positive Pulse	138.53	137.00	139.00	0.09	Pass
	30	Negative Pulse	137.58	137.00	139.00	0.09	Pass
		Positive Pulse	137.58	137.00	139.00	0.09	Pass

-- End of measurement results--

Positive Pulse Crest Factor

200 µs pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
138.00	3	OVLD	± 0.50	0.09	Pass
	5	OVLD	± 1.00	0.09	Pass
	10	OVLD	± 1.50	0.09	Pass
128.00	3	-0.12	± 0.50	0.10	Pass
	5	-0.13	± 1.00	0.09	Pass
	10	OVLD	± 1.50	0.09	Pass
118.00	3	-0.13	± 0.50	0.10	Pass
	5	-0.11	± 1.00	0.09	Pass
	10	-0.16	± 1.50	0.09	Pass
108.00	3	-0.14	± 0.50	0.13	Pass
	5	-0.13	± 1.00	0.09	Pass
	10	-0.25	± 1.50	0.09	Pass

-- End of measurement results--

Negative Pulse Crest Factor

200 µs pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
138.00	3	OVLD	± 0.50	0.09	Pass
	5	OVLD	± 1.00	0.09	Pass
	10	OVLD	± 1.50	0.09	Pass
128.00	3	-0.12	± 0.50	0.09	Pass
	5	-0.12	± 1.00	0.09	Pass
	10	OVLD	± 1.50	0.09	Pass
118.00	3	-0.13	± 0.50	0.09	Pass
	5	-0.13	± 1.00	0.09	Pass
	10	-0.16	± 1.50	0.09	Pass
108.00	3	-0.14	± 0.50	0.09	Pass
	5	-0.14	± 1.00	0.09	Pass
	10	-0.25	± 1.50	0.09	Pass

-- End of measurement results--

Tone Burst

2kHz tone burst tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Tone burst response measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
138.00	3	OVLD	± 0.50	0.09	Pass
	5	OVLD	± 1.00	0.09	Pass
128.00	3	-0.06	± 0.50	0.12	Pass
	5	0.01	± 1.00	0.09	Pass
118.00	3	-0.05	± 0.50	0.09	Pass
	5	-0.03	± 1.00	0.09	Pass
108.00	3	-0.06	± 0.50	0.09	Pass
	5	-0.06	± 1.00	0.09	Pass

-- End of measurement results--

Impulse Detector - Repeat

Impulse Detector measured according to IEC 60651:2001 9.4.3 and ANSI S1.4:1983 (R2006) 8.4.3

Amplitude [dB]	Repitition Rate [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140	100.00	-2.74	-3.71	-1.71	0.09	Pass
	20.00	-7.81	-9.57	-5.57	0.09	Pass
	2.00	-8.87	-10.76	-6.76	0.09	Pass
Step	2.00	4.95	4.00	6.00	0.11	Pass

-- End of measurement results--

Impulse Detector - Single

Impulse Detector measured according to IEC 60651:2001 9.4.3 and ANSI S1.4:1983 (R2006) 8.4.3

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140	20.00	-3.64	-5.11	-2.11	0.09	Pass
	5.00	-8.87	-10.76	-6.76	0.10	Pass
	2.00	-12.56	-14.55	-10.55	0.11	Pass
Step	2.00	9.99	9.00	11.00	0.11	Pass

-- End of measurement results--

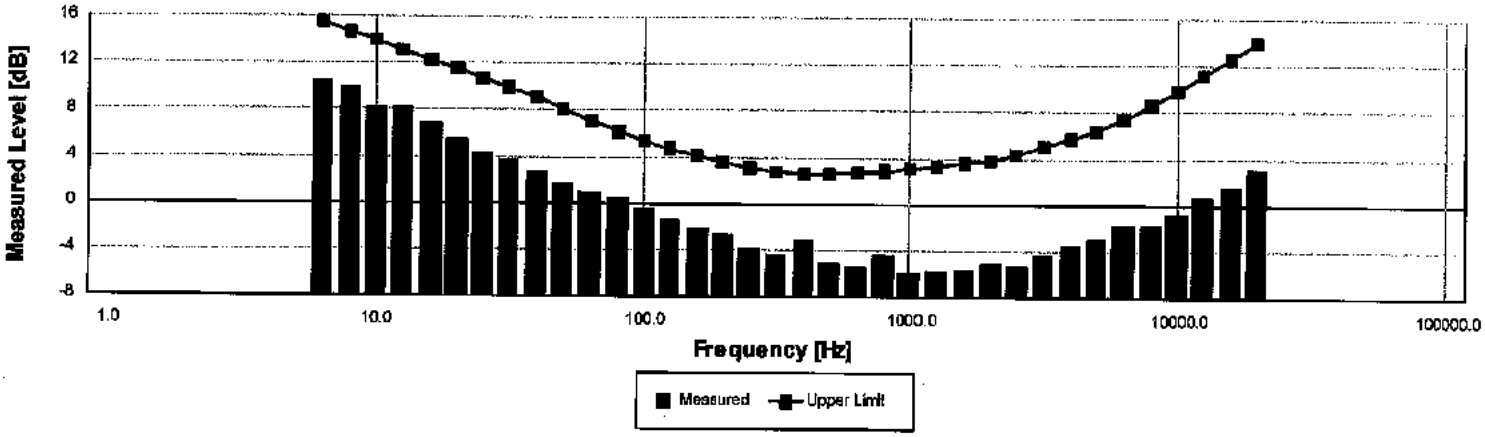
Gain

Gain measured according to IEC 61672-3:2013 17.3 and 17.4 and ANSI S1.4-2014 Part 3: 17.3 and 17.4

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
0 dB Gain	94.03	93.92	94.12	0.09	Pass
0 dB Gain, Linearity	28.97	28.32	29.72	0.10	Pass
20 dB Gain	94.03	93.92	94.12	0.09	Pass
20 dB Gain, Linearity	23.76	23.32	24.72	0.12	Pass
OBA Low Range	94.02	93.92	94.12	0.09	Pass
OBA Normal Range	94.02	93.20	94.80	0.09	Pass

-- End of measurement results--

1/3-Octave Self-Generated Noise



The SLM is set to low range and 20 dB gain.

Frequency [Hz]	Test Result [dB]	Upper limit [dB]	Result
6.30	10.53	15.50	Pass
8.00	10.03	14.70	Pass
10.00	8.27	13.90	Pass
12.50	8.22	13.10	Pass
16.00	6.80	12.30	Pass
20.00	5.49	11.50	Pass
25.00	4.20	10.70	Pass
31.50	3.82	9.90	Pass
40.00	2.73	9.10	Pass
50.00	1.72	8.10	Pass
63.00	1.03	7.10	Pass
80.00	0.47	6.10	Pass
100.00	-0.45	5.30	Pass
125.00	-1.41	4.70	Pass
160.00	-2.16	4.10	Pass
200.00	-2.58	3.60	Pass
250.00	-3.79	3.10	Pass
315.00	-4.41	2.70	Pass
400.00	-3.16	2.60	Pass
500.00	-5.03	2.60	Pass
630.00	-5.50	2.70	Pass
800.00	-4.33	2.80	Pass
1,000.00	-5.99	3.00	Pass
1,250.00	-5.79	3.20	Pass
1,600.00	-5.51	3.50	Pass
2,000.00	-5.00	3.80	Pass
2,500.00	-5.18	4.30	Pass
3,150.00	-4.44	4.90	Pass
4,000.00	-3.50	5.70	Pass
5,000.00	-3.05	6.40	Pass
6,300.00	-1.80	7.40	Pass
8,000.00	-1.77	8.60	Pass
10,000.00	-0.75	9.80	Pass
12,500.00	0.72	11.20	Pass
16,000.00	1.42	12.60	Pass
20,000.00	3.02	14.00	Pass

-- End of measurement results--

Broadband Noise Floor

Self-generated noise measured according to IEC 61672-3:2013 11.2 and ANSI S1.4-2014 Part 3: 11.2

Measurement	Test Result [dB]	Upper limit [dB]	Result
A-weight Noise Floor	8.50	15.00	Pass
C-weight Noise Floor	12.57	17.30	Pass
Z-weight Noise Floor	21.32	24.50	Pass

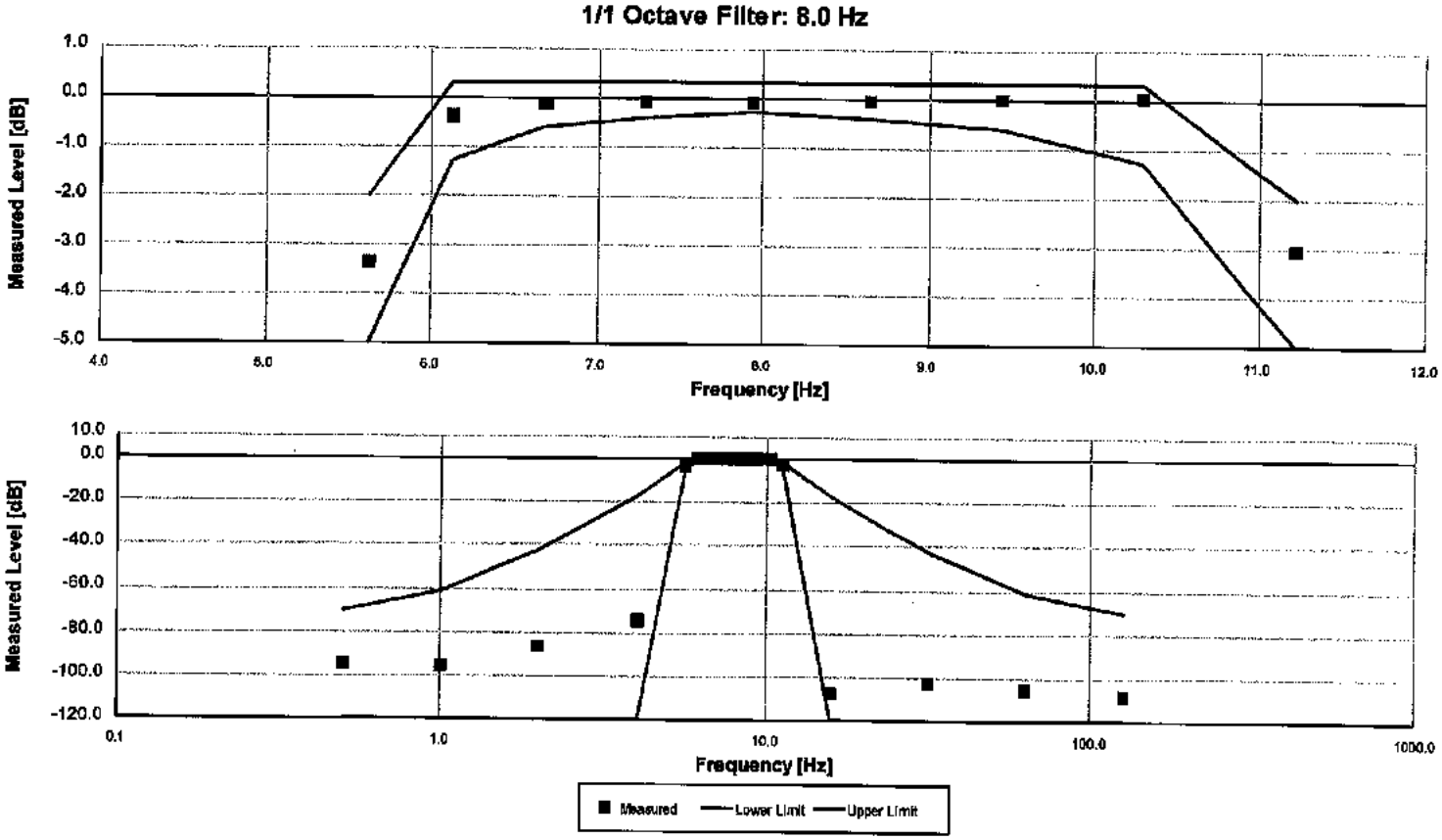
-- End of measurement results--

Total Harmonic Distortion

Measured using 1/3-Octave filters

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
10 Hz Signal	137.53	137.20	138.80	0.09	Pass
THD	-70.57		-60.00	0.01	Pass
THD+N	-64.74		-60.00	0.01	Pass

-- End of measurement results--

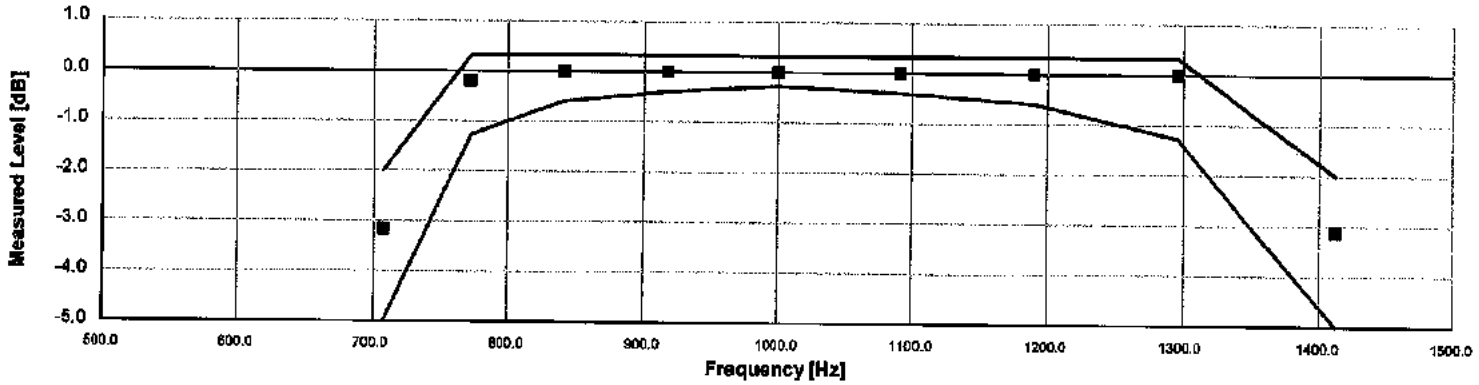


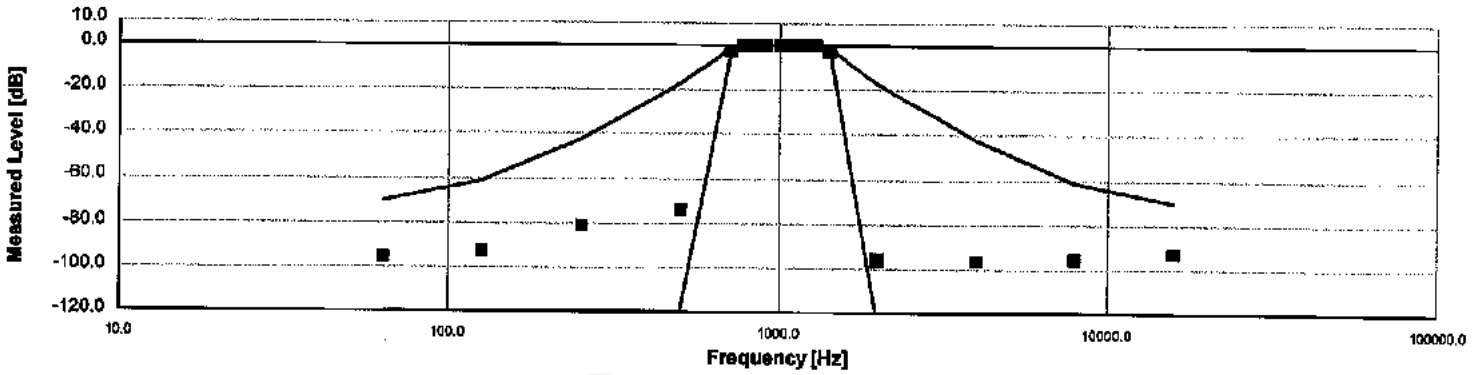
The SLM is set to normal range and 0 dB gain. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
0.50	-94.69	-inf	-70.00	2.40	Pass
1.00	-95.07	-inf	-61.00	2.20	Pass
2.00	-86.67	-inf	-42.00	0.24	Pass
3.98	-74.26	-inf	-17.50	0.23	Pass
5.62	-3.37	-5.00	-2.00	0.09	Pass
6.13	-0.39	-1.30	0.30	0.09	Pass
6.68	-0.14	-0.60	0.30	0.09	Pass
7.29	-0.11	-0.40	0.30	0.09	Pass
7.94	-0.08	-0.30	0.30	0.09	Pass
8.66	-0.05	-0.40	0.30	0.09	Pass
9.44	-0.01	-0.60	0.30	0.09	Pass
10.29	0.04	-1.30	0.30	0.09	Pass
11.22	-3.05	-5.00	-2.00	0.09	Pass
15.85	-106.72	-inf	-17.50	1.30	Pass
31.62	-102.80	-inf	-42.00	1.70	Pass
63.10	-105.30	-inf	-61.00	1.10	Pass
125.89	-107.76	-inf	-70.00	1.80	Pass

-- End of measurement results--

1/1 Octave Filter: 1 kHz



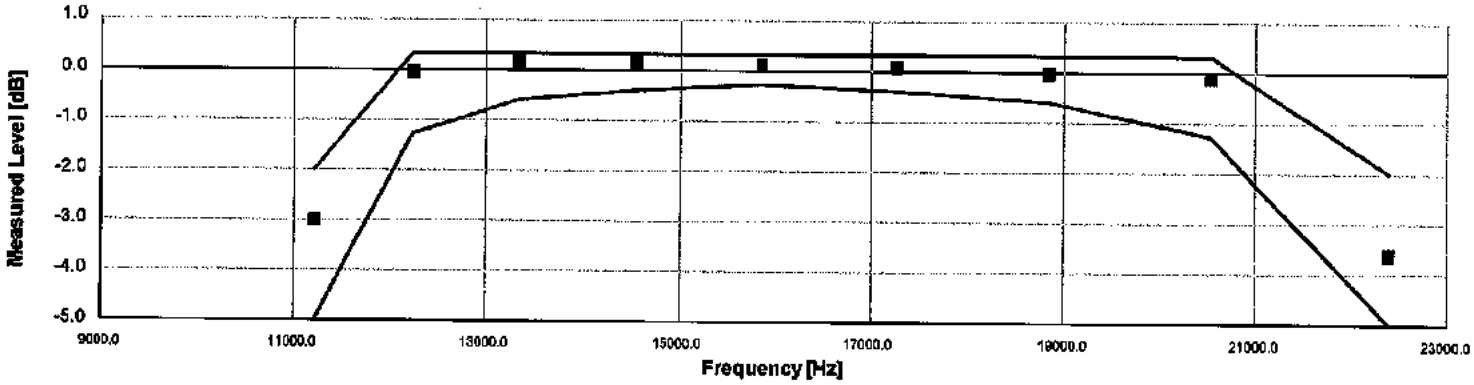


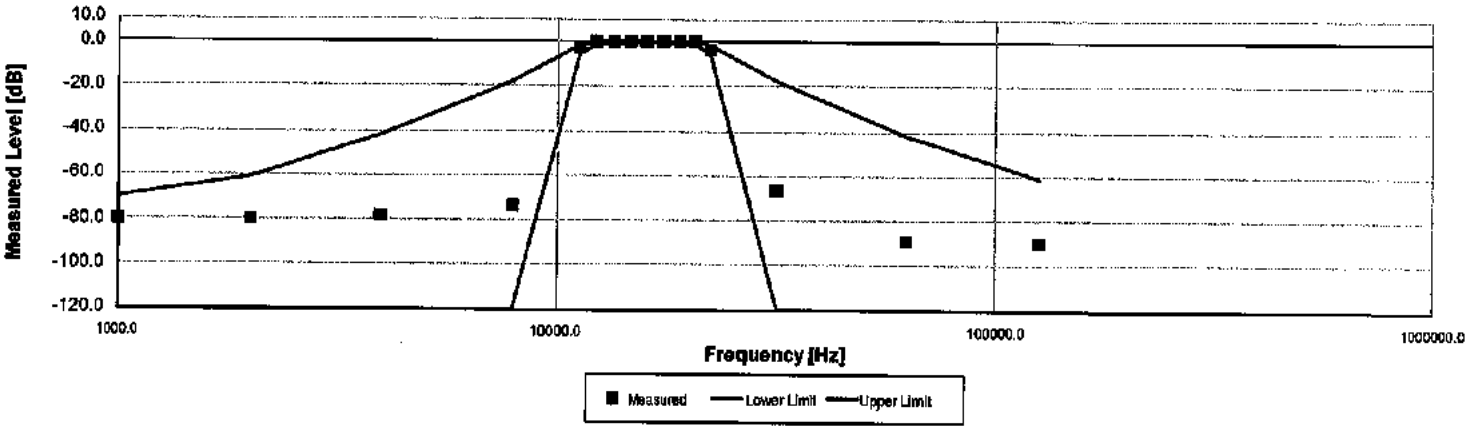
The SLM is set to normal range and 0 dB gain. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
63.10	-95.45	-inf	-70.00	0.28	Pass
125.89	-92.44	-inf	-61.00	0.32	Pass
251.19	-81.01	-inf	-42.00	0.18	Pass
501.19	-74.00	-inf	-17.50	0.09	Pass
707.95	-3.15	-5.00	-2.00	0.09	Pass
771.79	-0.23	-1.30	0.30	0.09	Pass
841.40	-0.02	-0.60	0.30	0.09	Pass
917.28	-0.01	-0.40	0.30	0.09	Pass
1,000.00	0.00	-0.30	0.30	0.09	Pass
1,090.18	-0.03	-0.40	0.30	0.09	Pass
1,188.50	-0.02	-0.60	0.30	0.09	Pass
1,295.69	0.00	-1.30	0.30	0.09	Pass
1,412.54	-3.14	-5.00	-2.00	0.09	Pass
1,995.26	-95.88	-inf	-17.50	0.26	Pass
3,981.07	-95.95	-inf	-42.00	0.26	Pass
7,943.28	-95.17	-inf	-61.00	0.31	Pass
15,848.93	-92.52	-inf	-70.00	0.24	Pass

-- End of measurement results--

1/1 Octave Filter: 16 kHz



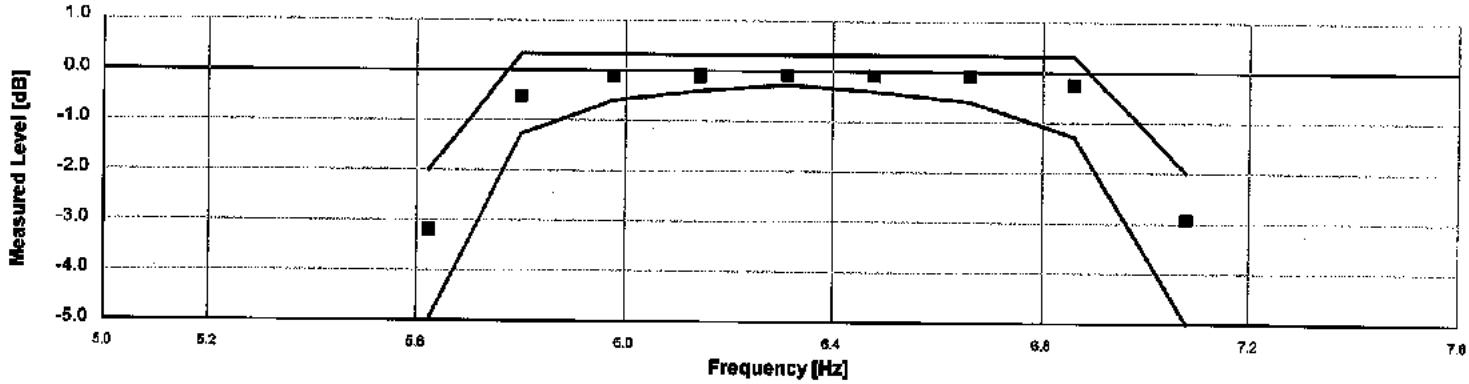


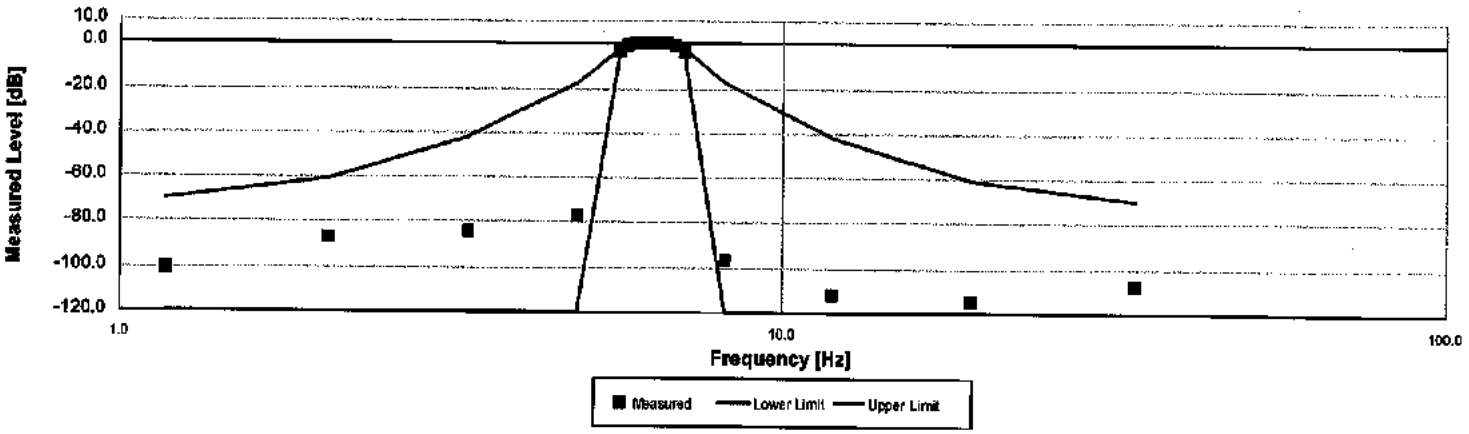
The SLM is set to normal range and 0 dB gain. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
1,000.00	-79.82	-inf	-70.00	0.11	Pass
1,995.26	-79.80	-inf	-61.00	0.09	Pass
3,981.07	-77.78	-inf	-42.00	0.10	Pass
7,943.28	-73.55	-inf	-17.50	0.10	Pass
11,220.18	-3.00	-5.00	-2.00	0.09	Pass
12,232.07	-0.07	-1.30	0.30	0.09	Pass
13,335.21	0.15	-0.60	0.30	0.09	Pass
14,537.84	0.12	-0.40	0.30	0.09	Pass
15,848.93	0.10	-0.30	0.30	0.09	Pass
17,278.26	0.05	-0.40	0.30	0.09	Pass
18,836.49	-0.04	-0.60	0.30	0.09	Pass
20,535.25	-0.14	-1.30	0.30	0.09	Pass
22,387.21	-3.62	-5.00	-2.00	0.09	Pass
31,622.78	-66.47	-inf	-17.50	0.09	Pass
63,095.73	-89.20	-inf	-42.00	0.10	Pass
125,892.54	-89.81	-inf	-61.00	0.09	Pass

-- End of measurement results--

1/3 Octave Filter: 6.3 Hz



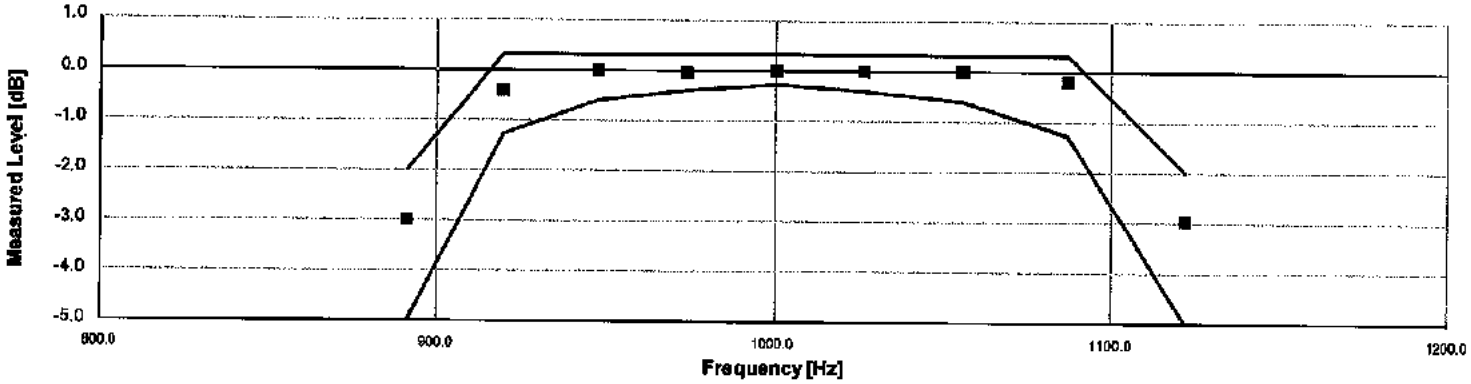


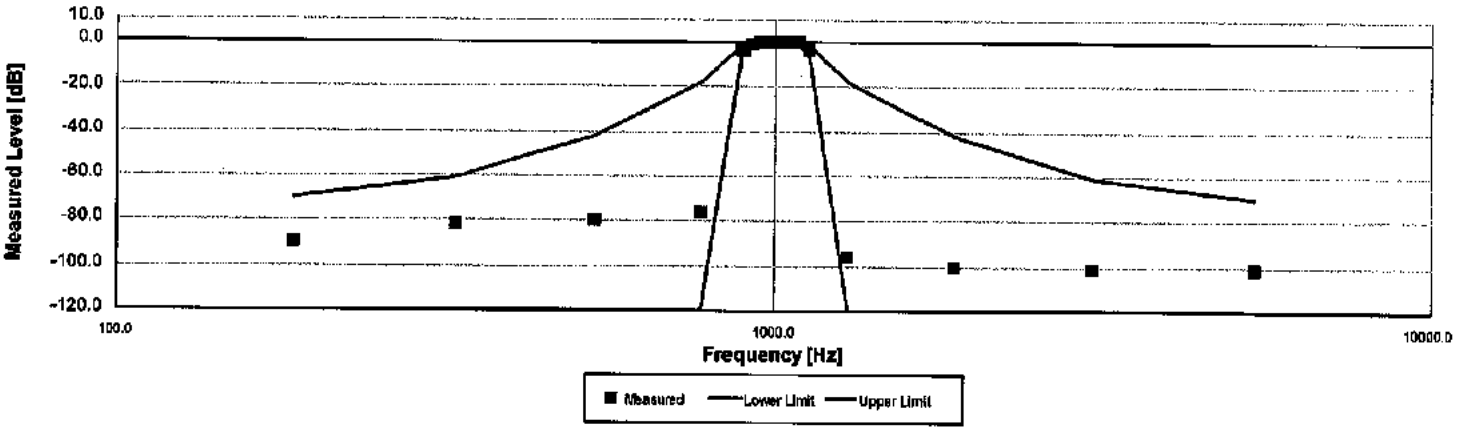
The SLM is set to normal range and 0 dB gain. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
1.17	-100.70	-inf	-70.00	0.36	Pass
2.07	-87.18	-inf	-61.00	0.11	Pass
3.35	-84.27	-inf	-42.00	0.09	Pass
4.87	-76.74	-inf	-17.50	0.10	Pass
5.62	-3.18	-5.00	-2.00	0.09	Pass
5.80	-0.53	-1.30	0.30	0.09	Pass
5.98	-0.12	-0.60	0.30	0.09	Pass
6.15	-0.11	-0.40	0.30	0.09	Pass
6.31	-0.10	-0.30	0.30	0.09	Pass
6.48	-0.10	-0.40	0.30	0.09	Pass
6.66	-0.08	-0.60	0.30	0.09	Pass
6.86	-0.26	-1.30	0.30	0.09	Pass
7.08	-2.91	-5.00	-2.00	0.09	Pass
8.17	-96.28	-inf	-17.50	0.34	Pass
11.87	-111.66	-inf	-42.00	1.70	Pass
19.27	-114.93	-inf	-61.00	2.50	Pass
34.02	-107.32	-inf	-70.00	2.10	Pass

-- End of measurement results--

1/3 Octave Filter: 1 kHz



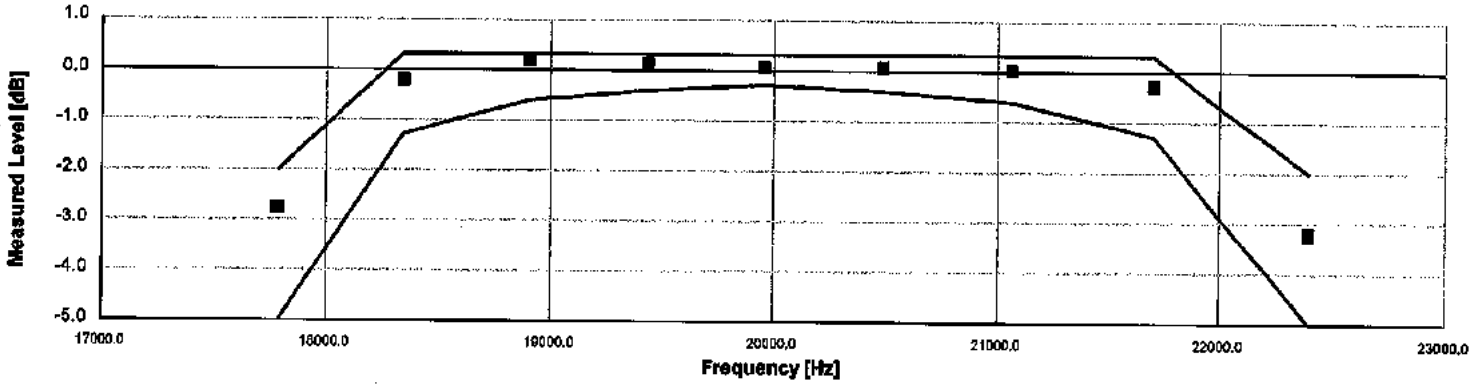


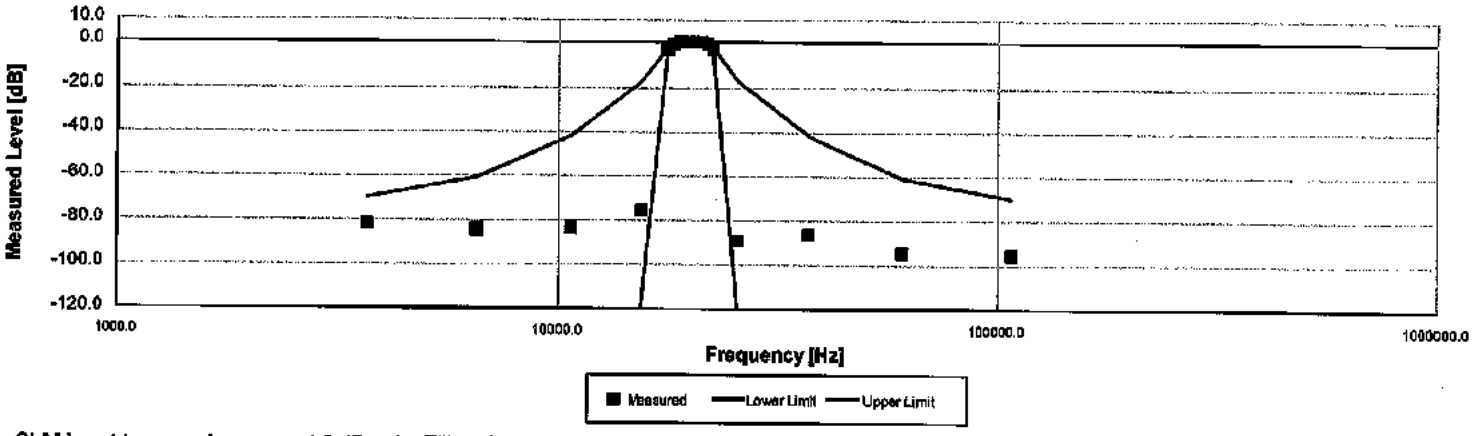
The SLM is set to normal range and 0 dB gain. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
185.46	-89.65	-inf	-70.00	0.17	Pass
327.48	-81.33	-inf	-61.00	0.12	Pass
531.43	-79.90	-inf	-42.00	0.25	Pass
772.57	-76.24	-inf	-17.50	0.09	Pass
891.25	-3.00	-5.00	-2.00	0.09	Pass
919.58	-0.40	-1.30	0.30	0.09	Pass
947.19	0.00	-0.60	0.30	0.09	Pass
974.02	-0.04	-0.40	0.30	0.09	Pass
1,000.00	0.00	-0.30	0.30	0.09	Pass
1,026.67	0.00	-0.40	0.30	0.09	Pass
1,055.75	-0.02	-0.60	0.30	0.09	Pass
1,087.46	-0.22	-1.30	0.30	0.09	Pass
1,122.02	-2.96	-5.00	-2.00	0.09	Pass
1,294.37	-95.88	-inf	-17.50	0.25	Pass
1,881.73	-100.75	-inf	-42.00	0.40	Pass
3,053.65	-101.60	-inf	-61.00	0.44	Pass
5,391.95	-101.27	-inf	-70.00	0.40	Pass

-- End of measurement results--

1/3 Octave Filter: 20 kHz





The SLM is set to normal range and 0 dB gain. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
3,700.45	-82.10	-inf	-70.00	0.11	Pass
6,534.02	-83.95	-inf	-61.00	0.11	Pass
10,603.35	-83.03	-inf	-42.00	0.13	Pass
15,414.88	-75.51	-inf	-17.50	0.09	Pass
17,782.79	-2.76	-5.00	-2.00	0.09	Pass
18,347.97	-0.21	-1.30	0.30	0.09	Pass
18,898.93	0.17	-0.60	0.30	0.09	Pass
19,434.23	0.12	-0.40	0.30	0.09	Pass
19,952.62	0.07	-0.30	0.30	0.09	Pass
20,484.85	0.06	-0.40	0.30	0.09	Pass
21,065.07	0.01	-0.60	0.30	0.09	Pass
21,697.62	-0.28	-1.30	0.30	0.09	Pass
22,387.21	-3.22	-5.00	-2.00	0.09	Pass
25,826.16	-89.17	-inf	-17.50	0.12	Pass
37,545.40	-85.93	-inf	-42.00	0.11	Pass
60,928.37	-94.03	-inf	-61.00	0.12	Pass
107,583.52	-95.02	-inf	-70.00	0.11	Pass

-- End of measurement results--

-- End of Report--

Signatory: *Ron Harris*

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3822.01

LARSON DAVIS
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Calibration Certificate

Certificate Number 2018000298

Customer:
Epsilon Associates Inc
Suite 250
3 Clock Tower Place
Maynard, MA 01754, United States

Model Number	377C20	***Procedure Number***	D0001.8387		
Serial Number	162996	***Technician***	Abraham Ortega		
Test Results	**Pass**	***Calibration Date***	5 Jan 2018		
Initial Condition	As Manufactured	***Calibration Due***	5 Jan 2019		
		Temperature	23.2	°C	± 0.01 °C
Description	1/2 inch Microphone - RI - 0V	***Humidity***	34.5	%RH	± 0.5 %RH
		Static Pressure	100.43	kPa	± 0.03 kPa

Evaluation Method Tested electrically using an electrostatic actuator.

Compliance Standards Compliant to Manufacturer Specifications.

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis Model 2900 Real Time Analyzer	07/17/2017	07/17/2018	001230
Microphone Calibration System	08/30/2017	08/30/2018	001233
1/2" Preamplifier	12/14/2017	12/14/2018	001274
Agilent 34401A DMM	12/07/2017	12/07/2018	001329
Larson Davis CAL250 Acoustic Calibrator	01/03/2018	01/03/2019	003030
1/2" Preamplifier	04/12/2017	04/12/2018	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	09/12/2017	09/12/2018	006507
1/2 inch Microphone - RI - 200V	04/24/2017	04/24/2018	006510
1/2 inch Microphone - RI - 200V	08/09/2017	08/09/2018	006519
Larson Davis 1/2" Preamplifier 7-pin LEMO	09/12/2017	09/12/2018	006530
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/11/2017	08/11/2018	006531

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Provo, UT 84601, United States
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Sensitivity

Measurement	Test Result [mV/Pa]	Lower limit [mV/Pa]	Upper limit [mV/Pa]	Expanded Uncertainty [mV/Pa]	Result
Open Circuit Sensitivity	50.16	42.17	59.57	1.20	Pass

-- End of measurement results--

Capacitance

Measurement	Test Result [pF]				
Capacitance	13.00			‡	

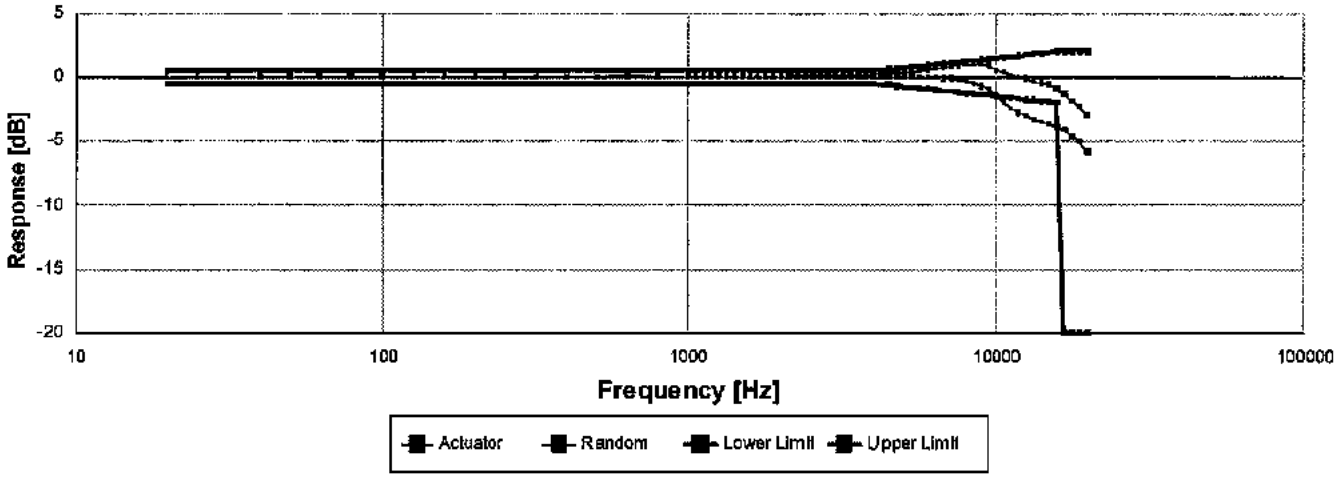
-- End of measurement results--

Lower Limiting Frequency

Measurement	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Result
-3 dB Frequency	1.82	1.00	2.40	Pass ‡

-- End of measurement results--

Frequency Response



Data is normalized for 0 dB @ 251.19 Hz.

Frequency [Hz]	Actuator [dB]	Random [dB]	Lower limit [dB]	Upper limit [dB]	Result
19.95	-0.03	-0.03	-0.50	0.50	Pass ‡
25.12	0.00	0.00	-0.50	0.50	Pass ‡
31.62	0.01	0.01	-0.50	0.50	Pass ‡
39.81	0.02	0.02	-0.50	0.50	Pass ‡
50.12	0.02	0.02	-0.50	0.50	Pass ‡
63.10	0.02	0.02	-0.50	0.50	Pass ‡
79.43	0.02	0.02	-0.50	0.50	Pass ‡
100.00	0.02	0.02	-0.50	0.50	Pass ‡
125.89	0.01	0.01	-0.50	0.50	Pass ‡
158.49	0.01	0.01	-0.50	0.50	Pass ‡
199.53	0.01	0.01	-0.50	0.50	Pass ‡

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Frequency [Hz]	Actuator [dB]	Random [dB]	Lower limit [dB]	Upper limit [dB]	Result
251.19	0.00	0.00	-0.50	0.50	Pass ‡
316.23	0.00	0.00	-0.50	0.50	Pass ‡
398.11	-0.01	0.00	-0.50	0.50	Pass ‡
501.19	-0.01	0.00	-0.50	0.50	Pass ‡
630.96	-0.02	0.16	-0.50	0.50	Pass ‡
794.33	-0.01	0.01	-0.50	0.50	Pass ‡
1,000.00	-0.02	0.01	-0.50	0.50	Pass ‡
1,059.25	-0.02	0.01	-0.50	0.50	Pass ‡
1,122.02	-0.02	0.01	-0.50	0.50	Pass ‡
1,188.50	-0.02	0.01	-0.50	0.50	Pass ‡
1,258.93	-0.01	0.02	-0.50	0.50	Pass ‡
1,333.52	-0.02	0.02	-0.50	0.50	Pass ‡
1,412.54	-0.02	0.02	-0.50	0.50	Pass ‡
1,496.24	-0.02	0.02	-0.50	0.50	Pass ‡
1,584.89	-0.02	0.02	-0.50	0.50	Pass ‡
1,678.80	-0.02	0.02	-0.50	0.50	Pass ‡
1,778.28	-0.02	0.02	-0.50	0.50	Pass ‡
1,883.65	-0.02	0.03	-0.50	0.50	Pass ‡
1,995.26	-0.01	0.04	-0.50	0.50	Pass ‡
2,113.49	-0.01	0.04	-0.50	0.50	Pass ‡
2,238.72	-0.01	0.05	-0.50	0.50	Pass ‡
2,371.37	-0.01	0.05	-0.50	0.50	Pass ‡
2,511.89	0.01	0.08	-0.50	0.50	Pass ‡
2,660.73	0.01	0.08	-0.50	0.50	Pass ‡
2,818.38	0.01	0.09	-0.50	0.50	Pass ‡
2,985.38	0.01	0.10	-0.50	0.50	Pass ‡
3,162.28	0.01	0.12	-0.50	0.50	Pass ‡
3,349.65	0.02	0.14	-0.50	0.50	Pass ‡
3,548.13	0.03	0.17	-0.50	0.50	Pass ‡
3,758.37	0.03	0.19	-0.50	0.50	Pass ‡
3,981.07	0.03	0.22	-0.50	0.50	Pass ‡
4,216.97	0.03	0.26	-0.63	0.56	Pass ‡
4,466.84	0.01	0.29	-0.60	0.63	Pass ‡
4,731.51	0.01	0.34	-0.70	0.69	Pass ‡
5,011.87	0.01	0.40	-0.80	0.75	Pass ‡
5,308.84	0.01	0.47	-0.80	0.81	Pass ‡
5,623.41	0.00	0.54	-0.90	0.88	Pass ‡
5,956.62	-0.01	0.62	-0.90	0.94	Pass ‡
6,309.57	-0.03	0.71	-1.00	1.00	Pass ‡
6,683.44	-0.08	0.78	-1.10	1.06	Pass ‡
7,079.46	-0.13	0.87	-1.10	1.13	Pass ‡
7,498.94	-0.21	0.95	-1.20	1.19	Pass ‡
7,943.28	-0.32	1.01	-1.30	1.25	Pass ‡
8,413.95	-0.47	1.05	-1.30	1.31	Pass ‡
8,912.51	-0.68	1.04	-1.40	1.38	Pass ‡
9,440.61	-1.01	0.91	-1.40	1.43	Pass ‡
10,000.00	-1.55	0.59	-1.50	1.50	Pass ‡
10,592.54	-1.96	0.39	-1.60	1.56	Pass ‡
11,220.19	-2.47	0.09	-1.60	1.63	Pass ‡
11,885.02	-2.80	-0.06	-1.70	1.68	Pass ‡
12,589.25	-3.03	-0.13	-1.80	1.75	Pass ‡
13,335.21	-3.34	-0.33	-1.80	1.81	Pass ‡
14,125.38	-3.49	-0.42	-1.90	1.87	Pass ‡

Frequency [Hz]	Actuator [dB]	Random [dB]	Lower limit [dB]	Upper limit [dB]	Result
14,962.36	-3.63	-0.56	-1.93	1.93	Pass ‡
15,848.93	-3.90	-0.89	-2.00	2.00	Pass ‡
16,788.04	-4.12	-1.34		2.00	Pass ‡
17,782.80	-4.59	-1.81		2.00	Pass ‡
18,836.49	-4.99	-2.26		2.00	Pass ‡
19,952.62	-5.83	-2.93		2.00	Pass ‡

-- End of measurement results--

Signatory: *Abraham Ortega*

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1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3822.01

LARSON DAVIS
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Calibration Certificate

Certificate Number 2018000271

Customer:

Epsilon Associates Inc
Suite 250
3 Clock Tower Place
Maynard, MA 01754, United States

Model Number	831	***Procedure Number***	D0001.8378		
Serial Number	0003751	***Technician***	Ron Harris		
Test Results	**Pass**	***Calibration Date***	5 Jan 2018		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	5 Jan 2019		
		Temperature	23.39	°C	± 0.25 °C
Description	Larson Davis Model 831 Class 1 Sound Level Meter Firmware Revision: 2.314	***Humidity***	50	%RH	± 2.0 %RH
		Static Pressure	86.92	kPa	± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRM831 S/N 029562 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 50.0 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61252:2002	ANSI S1.11 (R2009) Class 1
IEC 61260:2001 Class 1	ANSI S1.25 (R2007)
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Correction data from Larson Davis Model 831 Sound Level Meter Manual, I831.01 Rev O, 2016-09-19

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa; Reference Range: 0 dB gain

Periodic tests were performed in accordance with precedures from IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part3.

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

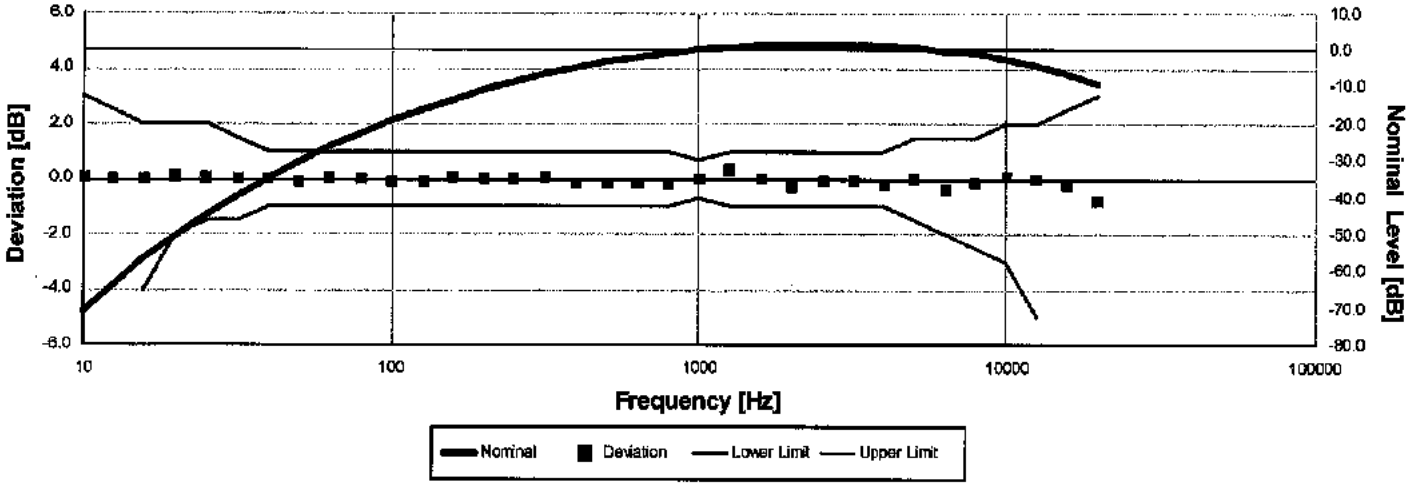
Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 successfully completed by Physikalisch-Technische Bundesanstalt (PTB) on 2016-02-24 certificate number DE-15-M-PTB-0056.

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part 3, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organization responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013 / ANSI/ASA S1.4-2014/Part 2, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1; the sound level meter submitted for testing conforms to the class 1specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
SRS DS360 Ultra Low Distortion Generator	2017-01-19	2018-01-19	006239
Hart Scientific 2626-S Humidity/Temperature Sensor	2017-06-11	2018-06-11	006943

A-weight Filter Response

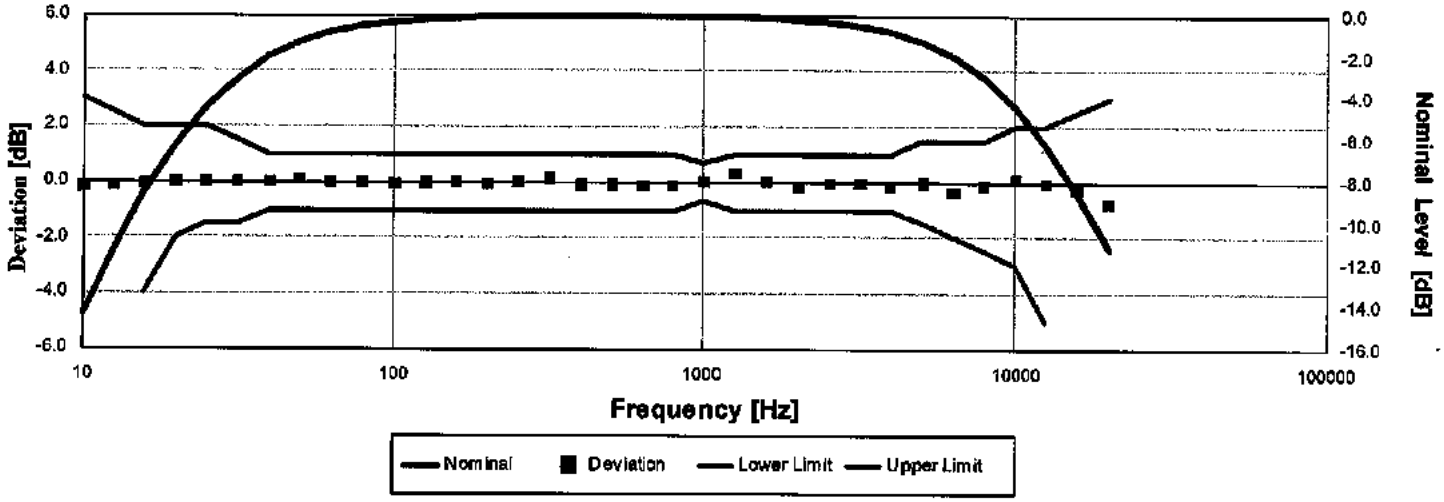


Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
10.00	-70.34	0.06	-inf	3.00	0.22	Pass
12.59	-63.41	-0.01	-inf	2.50	0.22	Pass
15.85	-56.70	0.00	-4.00	2.00	0.22	Pass
19.95	-50.39	0.11	-2.00	2.00	0.22	Pass
25.12	-44.66	0.04	-1.50	2.00	0.22	Pass
31.62	-39.41	-0.01	-1.50	1.50	0.22	Pass
39.81	-34.61	-0.01	-1.00	1.00	0.22	Pass
50.12	-30.24	-0.04	-1.00	1.00	0.22	Pass
63.10	-26.16	0.04	-1.00	1.00	0.22	Pass
79.43	-22.46	0.04	-1.00	1.00	0.22	Pass
100.00	-19.14	-0.04	-1.00	1.00	0.22	Pass
125.89	-16.15	-0.05	-1.00	1.00	0.22	Pass
158.49	-13.34	0.06	-1.00	1.00	0.22	Pass
199.53	-10.87	0.03	-1.00	1.00	0.22	Pass
251.19	-8.60	0.00	-1.00	1.00	0.22	Pass
316.23	-6.51	0.09	-1.00	1.00	0.22	Pass
398.11	-4.93	-0.13	-1.00	1.00	0.22	Pass
501.19	-3.35	-0.15	-1.00	1.00	0.22	Pass
630.96	-2.06	-0.16	-1.00	1.00	0.22	Pass
794.33	-0.98	-0.18	-1.00	1.00	0.22	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.22	Pass
1,258.93	0.94	0.34	-1.00	1.00	0.22	Pass
1,584.89	0.99	-0.01	-1.00	1.00	0.22	Pass
1,995.26	0.95	-0.25	-1.00	1.00	0.22	Pass
2,511.89	1.21	-0.09	-1.00	1.00	0.22	Pass
3,162.28	1.15	-0.05	-1.00	1.00	0.22	Pass
3,981.07	0.77	-0.23	-1.00	1.00	0.22	Pass
5,011.87	0.51	0.01	-1.50	1.50	0.22	Pass
6,309.57	-0.48	-0.38	-2.00	1.50	0.22	Pass
7,943.28	-1.22	-0.12	-2.50	1.50	0.22	Pass
10,000.00	-2.42	0.08	-3.00	2.00	0.22	Pass
12,589.25	-4.32	-0.02	-5.00	2.00	0.22	Pass
15,848.93	-6.82	-0.22	-16.00	2.50	0.22	Pass
19,952.62	-10.07	-0.77	-inf	3.00	0.22	Pass

-- End of measurement results--

C-weight Filter Response

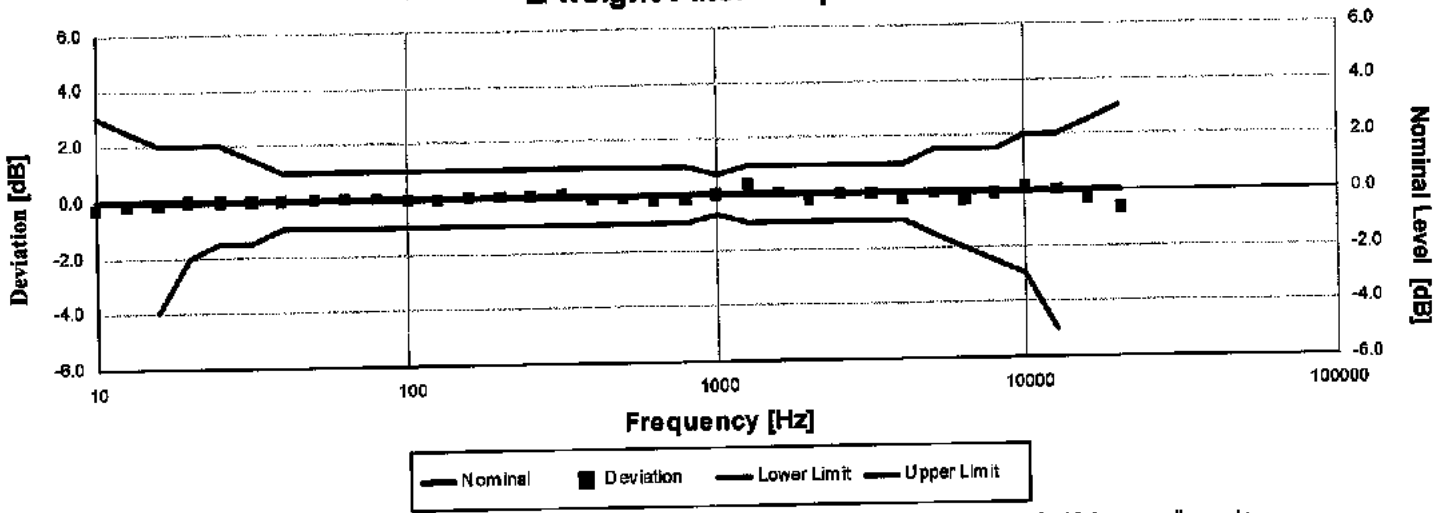


Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
10.00	-14.47	-0.17	-inf	3.00	0.22	Pass
12.59	-11.34	-0.14	-inf	2.50	0.22	Pass
15.85	-8.54	-0.04	-4.00	2.00	0.22	Pass
19.95	-6.18	0.02	-2.00	2.00	0.22	Pass
25.12	-4.36	0.04	-1.50	2.00	0.22	Pass
31.62	-2.99	0.01	-1.50	1.50	0.22	Pass
39.81	-1.98	0.02	-1.00	1.00	0.22	Pass
50.12	-1.20	0.10	-1.00	1.00	0.22	Pass
63.10	-0.79	0.01	-1.00	1.00	0.22	Pass
79.43	-0.47	0.03	-1.00	1.00	0.22	Pass
100.00	-0.33	-0.04	-1.00	1.00	0.22	Pass
125.89	-0.22	-0.02	-1.00	1.00	0.22	Pass
158.49	-0.07	0.03	-1.00	1.00	0.22	Pass
199.53	-0.03	-0.03	-1.00	1.00	0.22	Pass
251.19	0.02	0.02	-1.00	1.00	0.22	Pass
316.23	0.12	0.12	-1.00	1.00	0.22	Pass
398.11	-0.10	-0.10	-1.00	1.00	0.22	Pass
501.19	-0.09	-0.09	-1.00	1.00	0.22	Pass
630.96	-0.13	-0.13	-1.00	1.00	0.22	Pass
794.33	-0.14	-0.14	-1.00	1.00	0.22	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.22	Pass
1,258.93	0.32	0.32	-1.00	1.00	0.22	Pass
1,584.89	-0.07	0.03	-1.00	1.00	0.22	Pass
1,995.26	-0.42	-0.22	-1.00	1.00	0.22	Pass
2,511.89	-0.35	-0.05	-1.00	1.00	0.22	Pass
3,162.28	-0.55	-0.05	-1.00	1.00	0.22	Pass
3,981.07	-1.01	-0.21	-1.00	1.00	0.22	Pass
5,011.87	-1.33	-0.03	-1.50	1.50	0.22	Pass
6,309.57	-2.35	-0.35	-2.00	1.50	0.22	Pass
7,943.28	-3.11	-0.11	-2.50	1.50	0.22	Pass
10,000.00	-4.33	0.07	-3.00	2.00	0.22	Pass
12,589.25	-6.24	-0.04	-5.00	2.00	0.22	Pass
15,848.93	-8.75	-0.25	-16.00	2.50	0.22	Pass
19,952.62	-12.00	-0.80	-inf	3.00	0.22	Pass

-- End of measurement results--

Z-weight Filter Response



Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
10.00	-0.26	-0.26	-inf	3.00	0.22	Pass
12.59	-0.17	-0.17	-inf	2.50	0.22	Pass
15.85	-0.09	-0.09	-4.00	2.00	0.22	Pass
19.95	-0.01	-0.01	-2.00	2.00	0.22	Pass
25.12	-0.01	-0.01	-1.50	2.00	0.22	Pass
31.62	-0.01	-0.01	-1.50	1.50	0.22	Pass
39.81	-0.01	-0.01	-1.00	1.00	0.22	Pass
50.12	0.04	0.04	-1.00	1.00	0.22	Pass
63.10	0.01	0.01	-1.00	1.00	0.22	Pass
79.43	0.03	0.03	-1.00	1.00	0.22	Pass
100.00	-0.02	-0.02	-1.00	1.00	0.22	Pass
125.89	-0.05	-0.05	-1.00	1.00	0.22	Pass
158.49	0.01	0.01	-1.00	1.00	0.22	Pass
199.53	0.01	0.01	-1.00	1.00	0.22	Pass
251.19	0.04	0.04	-1.00	1.00	0.22	Pass
316.23	0.10	0.10	-1.00	1.00	0.22	Pass
398.11	-0.12	-0.12	-1.00	1.00	0.22	Pass
501.19	-0.12	-0.12	-1.00	1.00	0.22	Pass
630.96	-0.15	-0.15	-1.00	1.00	0.22	Pass
794.33	-0.15	-0.15	-1.00	1.00	0.22	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.22	Pass
1,258.93	0.35	0.35	-1.00	1.00	0.22	Pass
1,584.89	0.01	0.01	-1.00	1.00	0.22	Pass
1,995.26	-0.26	-0.26	-1.00	1.00	0.22	Pass
2,511.89	-0.06	-0.06	-1.00	1.00	0.22	Pass
3,162.28	-0.06	-0.06	-1.00	1.00	0.22	Pass
3,981.07	-0.21	-0.21	-1.00	1.00	0.22	Pass
5,011.87	-0.05	-0.05	-1.50	1.50	0.22	Pass
6,309.57	-0.35	-0.35	-2.00	1.50	0.22	Pass
7,943.28	-0.08	-0.08	-2.50	1.50	0.22	Pass
10,000.00	0.13	0.13	-3.00	2.00	0.22	Pass
12,589.25	0.01	0.01	-5.00	2.00	0.22	Pass
15,848.93	-0.35	-0.35	-16.00	2.50	0.22	Pass
19,952.62	-0.66	-0.66	-inf	3.00	0.22	Pass

-- End of measurement results--

High Level Stability

Electrical signal test of high level stability performed according to IEC 61672-3:2013 21 and ANSI S1.4-2014 Part 3: 21 for compliance to IEC 61672-1:2013 5.15 and ANSI S1.4-2014 Part 1: 5.15

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
High Level Stability	0.00	-0.10	0.10	0.01	Pass

-- End of measurement results--

Long-Term Stability

Electrical signal test of long term stability performed according to IEC 61672-3:2013 15 and ANSI S1.4-2014 Part 3: 15 for compliance to ISC 61672-1:2013 5.14 and ANSI S1.4-2014 Part 1: 5.14

Test Duration [min]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
34	0.00	-0.10	0.10	0.01	Pass

-- End of measurement results--

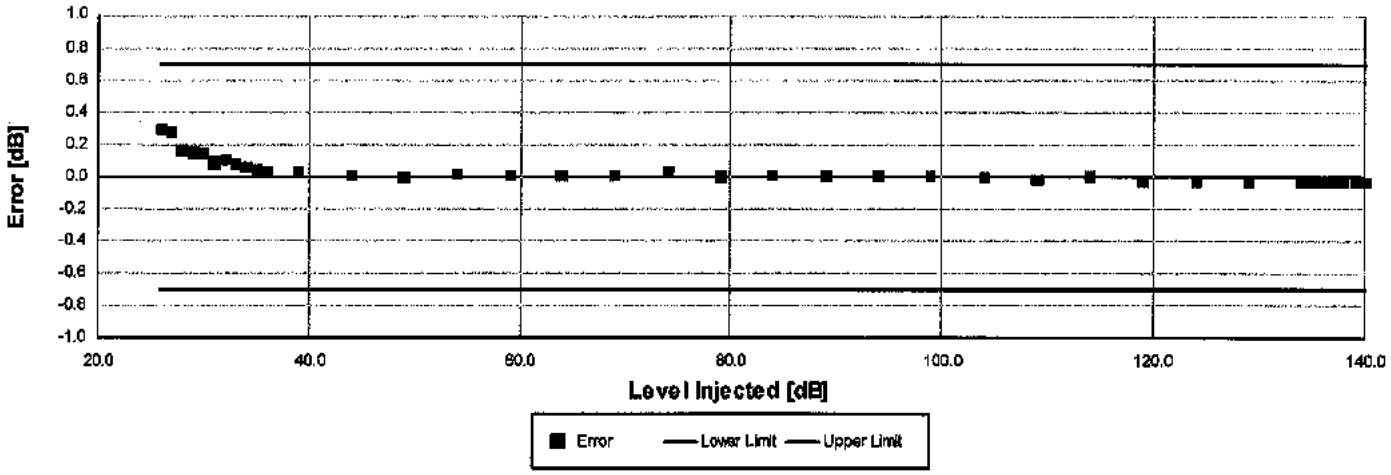
1 kHz Reference Levels

Frequency weightings and time weightings at 1 kHz (reference is A weighted Fast) performed according to IEC 61672-3:2013 14 and ANSI S1.4-2014 Part 3: 14 for compliance to IEC 61672-1:2013 5.5.9 and 5.8.3 and ANSI S1.4-2014 Part 1: 5.5.9 and 5.8.3

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
C weight	113.98	113.78	114.18	0.09	Pass
Z weight	113.97	113.78	114.18	0.09	Pass
Slow	113.98	113.88	114.08	0.09	Pass
Impulse	113.98	113.88	114.08	0.09	Pass

-- End of measurement results--

A-weighted 0 dB Gain Broadband Log Linearity: 8,000.00 Hz



Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6, IEC 60804:2000 6.2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6.9, ANSI S1.4-2014 Part 1: 5.6, ANSI S1.43 (R2007) 6.2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
26.00	0.29	-0.70	0.70	0.09	Pass
27.00	0.28	-0.70	0.70	0.09	Pass
28.00	0.16	-0.70	0.70	0.09	Pass
29.00	0.15	-0.70	0.70	0.09	Pass
30.00	0.14	-0.70	0.70	0.09	Pass
31.00	0.09	-0.70	0.70	0.09	Pass
32.00	0.10	-0.70	0.70	0.09	Pass
33.00	0.08	-0.70	0.70	0.09	Pass
34.00	0.06	-0.70	0.70	0.09	Pass
35.00	0.04	-0.70	0.70	0.09	Pass
36.00	0.03	-0.70	0.70	0.09	Pass
39.00	0.03	-0.70	0.70	0.09	Pass
44.00	0.01	-0.70	0.70	0.09	Pass
49.00	0.00	-0.70	0.70	0.09	Pass
54.00	0.02	-0.70	0.70	0.09	Pass
59.00	0.01	-0.70	0.70	0.09	Pass
64.00	0.01	-0.70	0.70	0.09	Pass
69.00	0.01	-0.70	0.70	0.09	Pass
74.00	0.03	-0.70	0.70	0.09	Pass
79.00	0.00	-0.70	0.70	0.09	Pass
84.00	0.00	-0.70	0.70	0.09	Pass
89.00	0.01	-0.70	0.70	0.09	Pass
94.00	0.00	-0.70	0.70	0.09	Pass
99.00	0.01	-0.70	0.70	0.09	Pass
104.00	-0.01	-0.70	0.70	0.09	Pass
109.00	-0.02	-0.70	0.70	0.09	Pass
114.00	0.00	-0.70	0.70	0.09	Pass
119.00	-0.03	-0.70	0.70	0.09	Pass
124.00	-0.03	-0.70	0.70	0.09	Pass
129.00	-0.03	-0.70	0.70	0.09	Pass
134.00	-0.03	-0.70	0.70	0.09	Pass
135.00	-0.03	-0.70	0.70	0.09	Pass
136.00	-0.03	-0.70	0.70	0.09	Pass
137.00	-0.03	-0.70	0.70	0.09	Pass
138.00	-0.03	-0.70	0.70	0.09	Pass
139.00	-0.03	-0.70	0.70	0.09	Pass

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140.00	-0.03	-0.70	0.70	0.09	Pass

-- End of measurement results--

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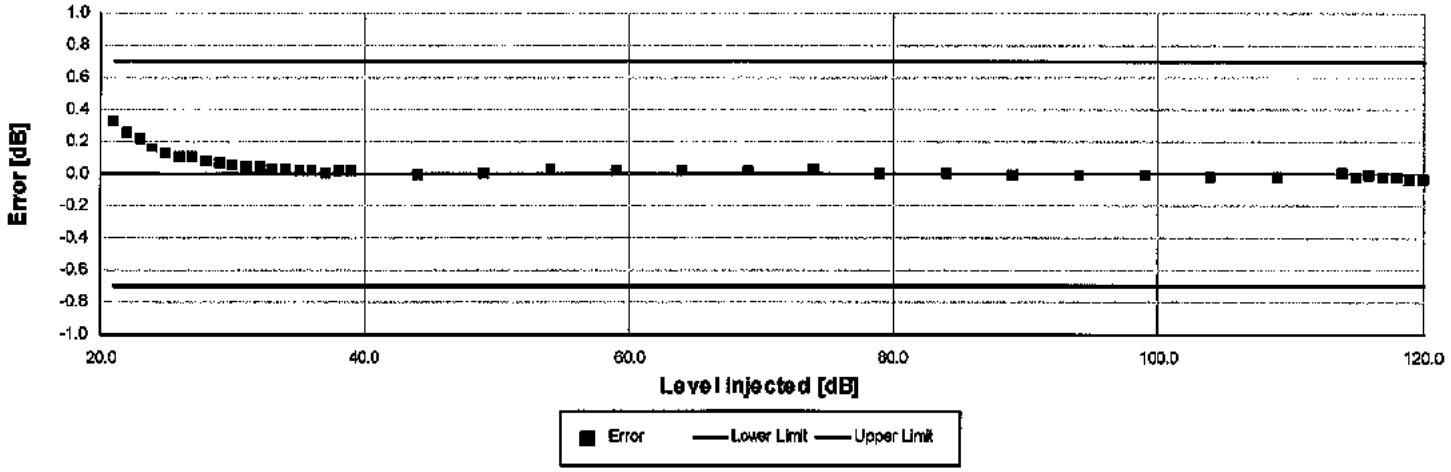
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

A-weighted 20 dB Gain Broadband Log Linearity: 8,000.00 Hz



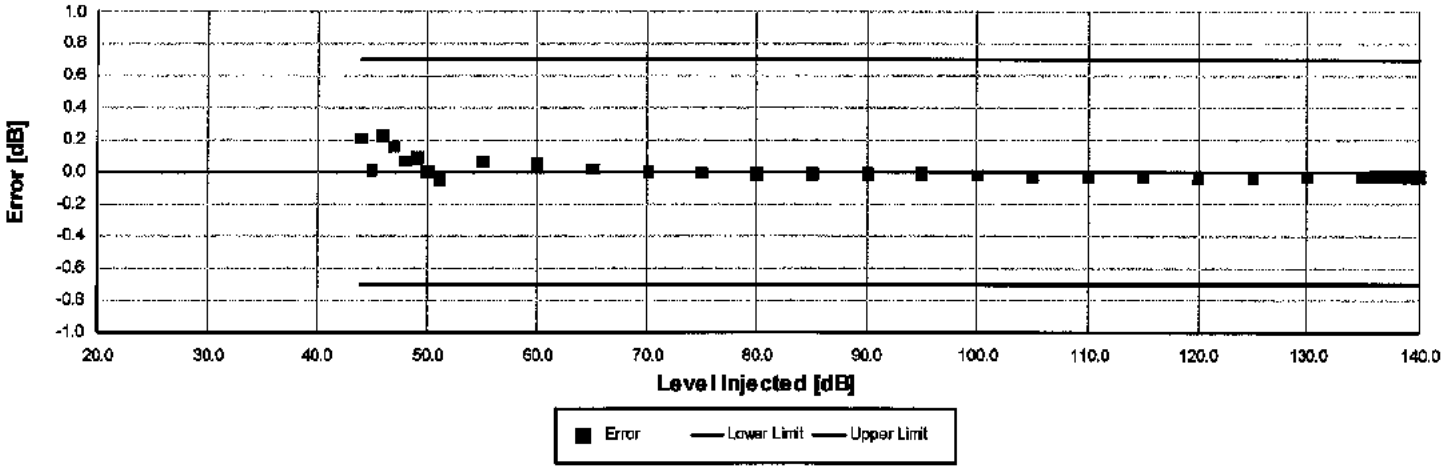
Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6, IEC 60804:2000 6.2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6.9, ANSI S1.4-2014 Part 1: 5.6, ANSI S1.43 (R2007) 6.2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
21.00	0.33	-0.70	0.70	0.09	Pass
22.00	0.26	-0.70	0.70	0.09	Pass
23.00	0.22	-0.70	0.70	0.09	Pass
24.00	0.16	-0.70	0.70	0.09	Pass
25.00	0.13	-0.70	0.70	0.09	Pass
26.00	0.11	-0.70	0.70	0.09	Pass
27.00	0.10	-0.70	0.70	0.09	Pass
28.00	0.08	-0.70	0.70	0.09	Pass
29.00	0.06	-0.70	0.70	0.09	Pass
30.00	0.06	-0.70	0.70	0.09	Pass
31.00	0.04	-0.70	0.70	0.09	Pass
32.00	0.04	-0.70	0.70	0.09	Pass
33.00	0.03	-0.70	0.70	0.09	Pass
34.00	0.03	-0.70	0.70	0.09	Pass
35.00	0.01	-0.70	0.70	0.09	Pass
36.00	0.01	-0.70	0.70	0.09	Pass
37.00	0.01	-0.70	0.70	0.09	Pass
38.00	0.01	-0.70	0.70	0.09	Pass
39.00	0.01	-0.70	0.70	0.09	Pass
44.00	0.00	-0.70	0.70	0.09	Pass
49.00	0.00	-0.70	0.70	0.09	Pass
54.00	0.03	-0.70	0.70	0.09	Pass
59.00	0.02	-0.70	0.70	0.09	Pass
64.00	0.01	-0.70	0.70	0.09	Pass
69.00	0.02	-0.70	0.70	0.09	Pass
74.00	0.03	-0.70	0.70	0.09	Pass
79.00	0.00	-0.70	0.70	0.09	Pass
84.00	0.00	-0.70	0.70	0.09	Pass
89.00	0.00	-0.70	0.70	0.09	Pass
94.00	-0.01	-0.70	0.70	0.09	Pass
99.00	-0.01	-0.70	0.70	0.09	Pass
104.00	-0.02	-0.70	0.70	0.09	Pass
109.00	-0.02	-0.70	0.70	0.09	Pass
114.00	0.00	-0.70	0.70	0.09	Pass
115.00	-0.02	-0.70	0.70	0.09	Pass
116.00	-0.01	-0.70	0.70	0.09	Pass

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
117.00	-0.02	-0.70	0.70	0.09	Pass
118.00	-0.02	-0.70	0.70	0.09	Pass
119.00	-0.03	-0.70	0.70	0.09	Pass
120.00	-0.03	-0.70	0.70	0.09	Pass

-- End of measurement results--

1/1 Octave Log Linearity: 1,000.00 Hz

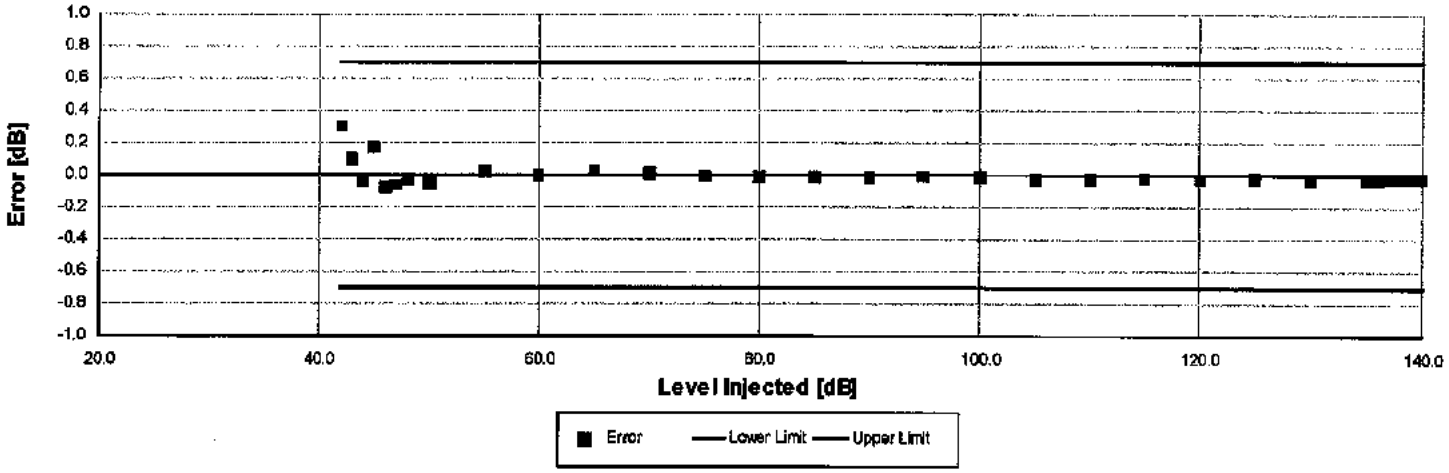


1/1 octave level linearity at normal range with 0 dB gain performed according to IEC 61260:2001 4.6, ANSI S.11 (R2009) 4.6

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
44.00	0.21	-0.70	0.70	0.09	Pass
45.00	0.02	-0.70	0.70	0.09	Pass
46.00	0.23	-0.70	0.70	0.09	Pass
47.00	0.16	-0.70	0.70	0.10	Pass
48.00	0.07	-0.70	0.70	0.10	Pass
49.00	0.09	-0.70	0.70	0.10	Pass
50.00	0.00	-0.70	0.70	0.09	Pass
51.00	-0.05	-0.70	0.70	0.09	Pass
55.00	0.06	-0.70	0.70	0.09	Pass
60.00	0.05	-0.70	0.70	0.09	Pass
65.00	0.02	-0.70	0.70	0.09	Pass
70.00	0.00	-0.70	0.70	0.09	Pass
75.00	-0.01	-0.70	0.70	0.09	Pass
80.00	-0.02	-0.70	0.70	0.09	Pass
85.00	-0.01	-0.70	0.70	0.09	Pass
90.00	-0.01	-0.70	0.70	0.09	Pass
95.00	-0.01	-0.70	0.70	0.09	Pass
100.00	-0.02	-0.70	0.70	0.09	Pass
105.00	-0.03	-0.70	0.70	0.09	Pass
110.00	-0.03	-0.70	0.70	0.09	Pass
115.00	-0.03	-0.70	0.70	0.09	Pass
120.00	-0.04	-0.70	0.70	0.09	Pass
125.00	-0.04	-0.70	0.70	0.09	Pass
130.00	-0.03	-0.70	0.70	0.09	Pass
135.00	-0.03	-0.70	0.70	0.09	Pass
136.00	-0.03	-0.70	0.70	0.09	Pass
137.00	-0.03	-0.70	0.70	0.09	Pass
138.00	-0.03	-0.70	0.70	0.09	Pass
139.00	-0.03	-0.70	0.70	0.09	Pass
140.00	-0.03	-0.70	0.70	0.09	Pass

-- End of measurement results--

1/3 Octave Log Linearity: 1,000.00 Hz



1/3 octave level linearity at normal range with 0 dB gain performed according to IEC 61260:2001 4.6, ANSI S.11 (R2009) 4.6

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
42.00	0.30	-0.70	0.70	0.09	Pass
43.00	0.10	-0.70	0.70	0.10	Pass
44.00	-0.04	-0.70	0.70	0.10	Pass
45.00	0.17	-0.70	0.70	0.10	Pass
46.00	-0.08	-0.70	0.70	0.09	Pass
47.00	-0.06	-0.70	0.70	0.09	Pass
48.00	-0.03	-0.70	0.70	0.09	Pass
50.00	-0.06	-0.70	0.70	0.09	Pass
55.00	0.02	-0.70	0.70	0.09	Pass
60.00	0.00	-0.70	0.70	0.09	Pass
65.00	0.03	-0.70	0.70	0.09	Pass
70.00	0.01	-0.70	0.70	0.09	Pass
75.00	-0.01	-0.70	0.70	0.09	Pass
80.00	-0.02	-0.70	0.70	0.09	Pass
85.00	-0.02	-0.70	0.70	0.09	Pass
90.00	-0.02	-0.70	0.70	0.09	Pass
95.00	-0.01	-0.70	0.70	0.09	Pass
100.00	-0.02	-0.70	0.70	0.09	Pass
105.00	-0.03	-0.70	0.70	0.09	Pass
110.00	-0.03	-0.70	0.70	0.09	Pass
115.00	-0.02	-0.70	0.70	0.09	Pass
120.00	-0.04	-0.70	0.70	0.09	Pass
125.00	-0.03	-0.70	0.70	0.09	Pass
130.00	-0.03	-0.70	0.70	0.09	Pass
135.00	-0.03	-0.70	0.70	0.09	Pass
136.00	-0.02	-0.70	0.70	0.09	Pass
137.00	-0.02	-0.70	0.70	0.09	Pass
138.00	-0.02	-0.70	0.70	0.09	Pass
139.00	-0.02	-0.70	0.70	0.09	Pass
140.00	-0.02	-0.70	0.70	0.09	Pass

-- End of measurement results--

Slow Detector

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200	-7.55	-7.92	-6.92	0.09	Pass
	2	-27.16	-29.99	-25.99	0.09	Pass

-- End of measurement results--

Fast Detector

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200.00	-1.09	-1.48	-0.48	0.09	Pass
	2.00	-18.35	-19.49	-16.99	0.09	Pass
	0.25	-27.31	-29.99	-25.99	0.09	Pass

-- End of measurement results--

Sound Exposure Level

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200.00	-7.01	-7.49	-6.49	0.09	Pass
	2.00	-27.04	-28.49	-25.99	0.09	Pass
	0.25	-36.15	-39.02	-35.02	0.09	Pass

-- End of measurement results--

Peak C-weight

C-weighted peak sound level performed according to IEC 61672-3:2013 19 and ANSI S1.4-2014 Part 3: 19 for compliance to IEC 61672-1:2013 5.13 and ANSI S1.4-2014 Part 1: 5.13

Level [dB]	Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
135.00	31.50	138.22	135.50	139.50	0.09	Pass
135.00	500.00	138.56	137.50	139.50	0.09	Pass
135.00	8,000.00	137.73	136.40	140.40	0.10	Pass
135.00, Negative	500.00	137.16	136.40	138.40	0.09	Pass
135.00, Positive	500.00	137.16	136.40	138.40	0.09	Pass

-- End of measurement results--

Peak Z-weight

Z-weighted peak sound level performed according to IEC 60651:2001 9.4.4 and ANSI S1.4:1983 (R2006) 8.4.4

Amplitude [dB]	Duration [µs]		Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
136.00	100	Negative Pulse	136.34	133.99	137.99	0.09	Pass
	100	Positive Pulse	136.35	134.01	138.01	0.09	Pass
126.00	100	Negative Pulse	126.36	124.01	128.01	0.09	Pass
	100	Positive Pulse	126.34	124.01	128.01	0.09	Pass
116.00	100	Negative Pulse	116.37	114.02	118.02	0.09	Pass
	100	Positive Pulse	116.34	114.01	118.01	0.09	Pass
106.00	100	Negative Pulse	106.35	104.01	108.01	0.09	Pass
	100	Positive Pulse	106.35	104.00	108.00	0.09	Pass

-- End of measurement results--

Overload Detector

Overload indication performed according to IEC 61672-3:2013 20 and ANSI S1.4-2014 Part 3: 20 for compliance to IEC 61672-1:2013 5.11, IEC 60804:2000 9.3.5, IEC 61252:2002 11, ANSI S1.4 (R2006) 5.8, and ANSI S1.4-2014 Part 1: 5.11, ANSI S1.25 (R2007) 7.8, ANSI S1.43 (R2007) 7

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
Positive	141.10	140.00	142.00	0.09	Pass
Negative	141.00	140.00	142.00	0.09	Pass
Difference	0.10	-1.50	1.50	0.10	Pass

-- End of measurement results--

Peak Rise Time

Peak rise time performed according to IEC 60651:2001 9.4.4 and ANSI S1.4:1983 (R2006) 8.4.4

Amplitude [dB]	Duration [µs]		Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	40	Negative Pulse	136.52	135.02	137.02	0.09	Pass
		Positive Pulse	136.52	135.00	137.00	0.09	Pass
	30	Negative Pulse	135.59	135.02	137.02	0.09	Pass
		Positive Pulse	135.55	135.00	137.00	0.09	Pass

-- End of measurement results--

Positive Pulse Crest Factor

200 µs pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
138.00	3	OVLD	± 0.50	0.09	Pass
	5	OVLD	± 1.00	0.09	Pass
	10	OVLD	± 1.50	0.09	Pass
128.00	3	-0.08	± 0.50	0.10	Pass
	5	-0.06	± 1.00	0.09	Pass
	10	OVLD	± 1.50	0.09	Pass
118.00	3	-0.09	± 0.50	0.10	Pass
	5	-0.07	± 1.00	0.09	Pass
	10	-0.04	± 1.50	0.09	Pass
108.00	3	-0.08	± 0.50	0.13	Pass
	5	-0.08	± 1.00	0.09	Pass
	10	-0.11	± 1.50	0.09	Pass

-- End of measurement results--

Negative Pulse Crest Factor

200 µs pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
138.00	3	OVLD	± 0.50	0.09	Pass
	5	OVLD	± 1.00	0.09	Pass
	10	OVLD	± 1.50	0.09	Pass
128.00	3	-0.08	± 0.50	0.09	Pass
	5	-0.07	± 1.00	0.09	Pass
	10	OVLD	± 1.50	0.09	Pass
118.00	3	-0.08	± 0.50	0.09	Pass
	5	-0.09	± 1.00	0.09	Pass
	10	-0.04	± 1.50	0.09	Pass
108.00	3	-0.07	± 0.50	0.09	Pass
	5	-0.08	± 1.00	0.09	Pass
	10	-0.11	± 1.50	0.09	Pass

-- End of measurement results--

Tone Burst

2kHz tone burst tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Tone burst response measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
138.00	3	OVLD	± 0.50	0.09	Pass
	5	OVLD	± 1.00	0.09	Pass
128.00	3	-0.06	± 0.50	0.12	Pass
	5	-0.06	± 1.00	0.09	Pass
118.00	3	-0.06	± 0.50	0.09	Pass
	5	0.00	± 1.00	0.09	Pass
108.00	3	-0.07	± 0.50	0.09	Pass
	5	-0.03	± 1.00	0.09	Pass

-- End of measurement results--

Impulse Detector - Repeat

Impulse Detector measured according to IEC 60651:2001 9.4.3 and ANSI S1.4:1983 (R2006) 8.4.3

Amplitude [dB]	Repitition Rate [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140	100.00	-2.82	-3.71	-1.71	0.09	Pass
	20.00	-7.57	-9.57	-5.57	0.09	Pass
	2.00	-8.91	-10.76	-6.76	0.09	Pass
Step	2.00	4.99	4.00	6.00	0.11	Pass

-- End of measurement results--

Impulse Detector - Single

Impulse Detector measured according to IEC 60651:2001 9.4.3 and ANSI S1.4:1983 (R2006) 8.4.3

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140	20.00	-3.66	-5.11	-2.11	0.09	Pass
	5.00	-8.95	-10.76	-6.76	0.10	Pass
	2.00	-12.61	-14.55	-10.55	0.11	Pass
Step	2.00	10.08	9.00	11.00	0.11	Pass

-- End of measurement results--

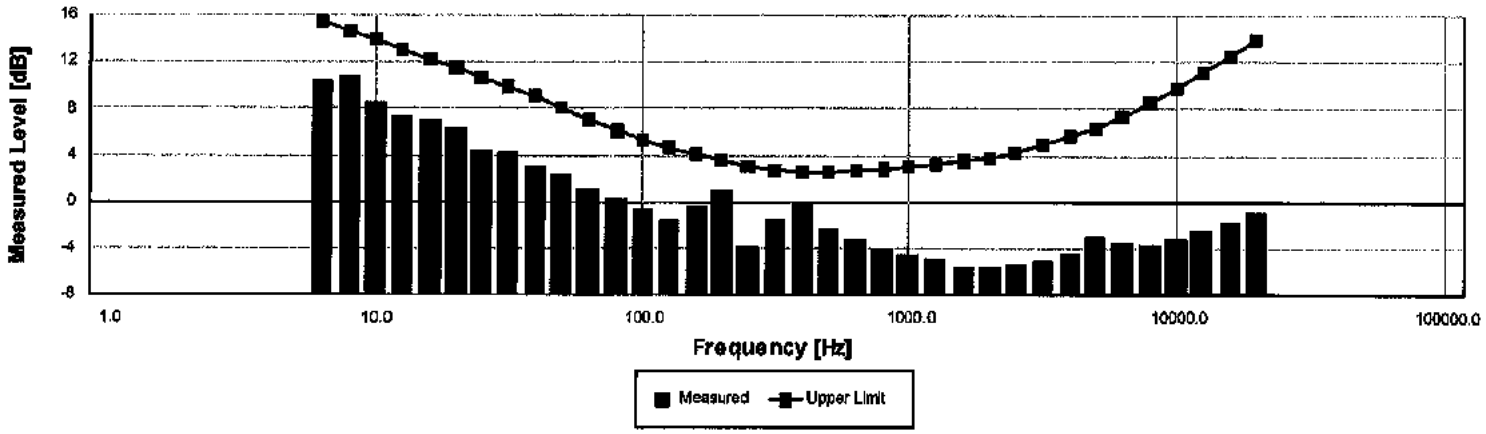
Gain

Gain measured according to IEC 61672-3:2013 17.3 and 17.4 and ANSI S1.4-2014 Part 3: 17.3 and 17.4

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
0 dB Gain	94.02	93.89	94.09	0.09	Pass
0 dB Gain, Linearity	28.95	28.29	29.69	0.10	Pass
20 dB Gain	94.01	93.89	94.09	0.09	Pass
20 dB Gain, Linearity	23.72	23.29	24.69	0.12	Pass
OBA Low Range	94.00	93.89	94.09	0.09	Pass
OBA Normal Range	93.99	93.20	94.80	0.09	Pass

-- End of measurement results--

1/3-Octave Self-Generated Noise



The SLM is set to low range and 20 dB gain.

Frequency [Hz]	Test Result [dB]	Upper limit [dB]	Result
6.30	10.52	15.50	Pass
8.00	10.77	14.70	Pass
10.00	8.61	13.90	Pass
12.50	7.40	13.10	Pass
16.00	7.04	12.30	Pass
20.00	6.39	11.50	Pass
25.00	4.48	10.70	Pass
31.50	4.30	9.90	Pass
40.00	3.07	9.10	Pass
50.00	2.29	8.10	Pass
63.00	1.10	7.10	Pass
80.00	0.21	6.10	Pass
100.00	-0.51	5.30	Pass
125.00	-1.53	4.70	Pass
160.00	-0.37	4.10	Pass
200.00	1.01	3.60	Pass
250.00	-3.83	3.10	Pass
315.00	-1.56	2.70	Pass
400.00	-0.10	2.60	Pass
500.00	-2.24	2.60	Pass
630.00	-3.16	2.70	Pass
800.00	-4.12	2.80	Pass
1,000.00	-4.55	3.00	Pass
1,250.00	-4.92	3.20	Pass
1,600.00	-5.67	3.50	Pass
2,000.00	-5.64	3.80	Pass
2,500.00	-5.35	4.30	Pass
3,150.00	-5.00	4.90	Pass
4,000.00	-4.45	5.70	Pass
5,000.00	-3.08	6.40	Pass
6,300.00	-3.57	7.40	Pass
8,000.00	-3.75	8.60	Pass
10,000.00	-3.21	9.80	Pass
12,500.00	-2.55	11.20	Pass
16,000.00	-1.72	12.60	Pass
20,000.00	-0.88	14.00	Pass

-- End of measurement results--

Broadband Noise Floor

Self-generated noise measured according to IEC 61672-3:2013 11.2 and ANSI S1.4-2014 Part 3: 11.2

Measurement	Test Result [dB]	Upper Limit [dB]	Result
A-weight Noise Floor	8.07	15.00	Pass
C-weight Noise Floor	13.13	17.30	Pass
Z-weight Noise Floor	22.48	24.50	Pass

-- End of measurement results--

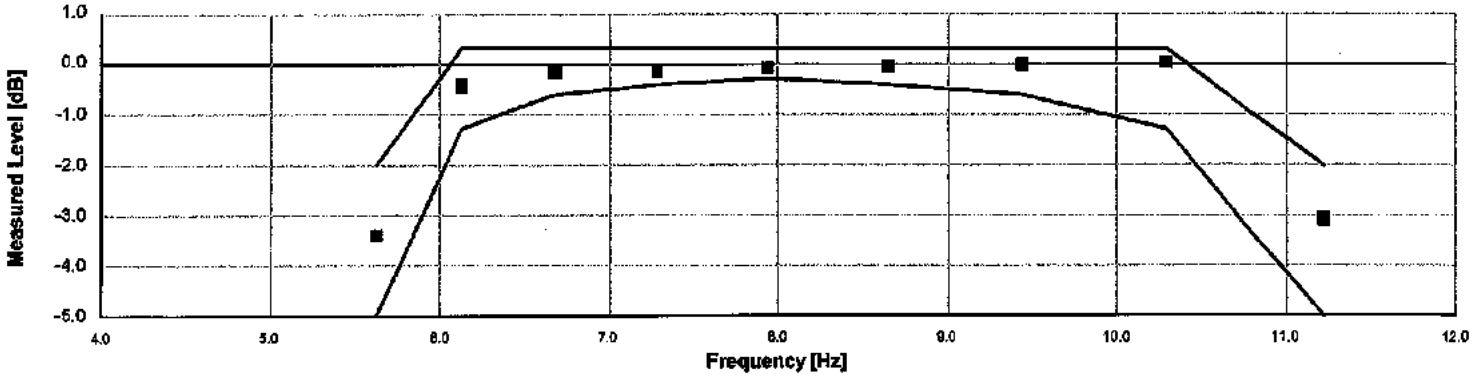
Total Harmonic Distortion

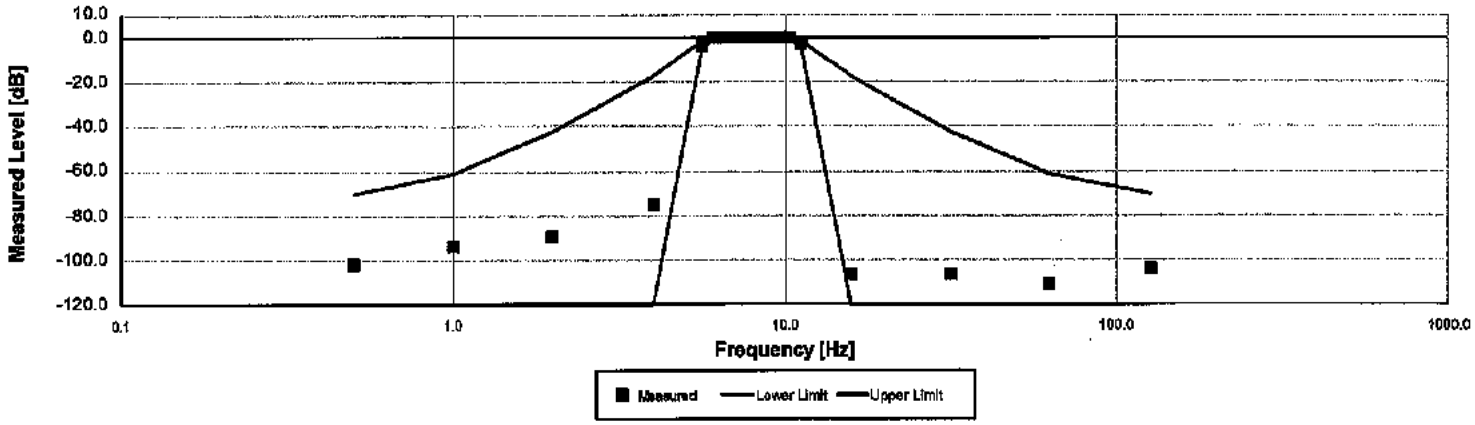
Measured using 1/3-Octave filters

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
10 Hz Signal	137.45	137.20	138.80	0.09	Pass
THD	-73.84		-60.00	0.01	Pass
THD+N	-66.52		-60.00	0.01	Pass

-- End of measurement results--

1/1 Octave Filter: 8.0 Hz



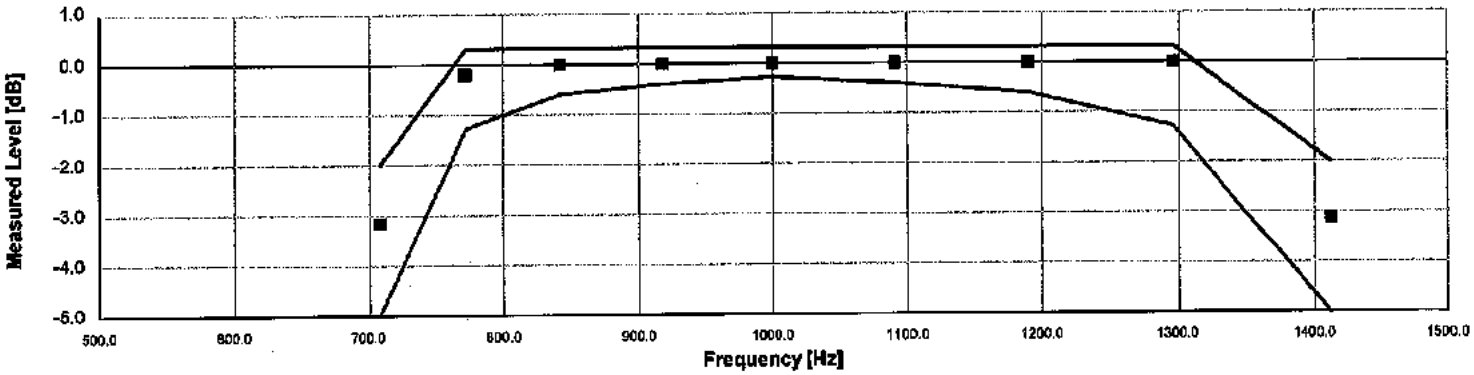


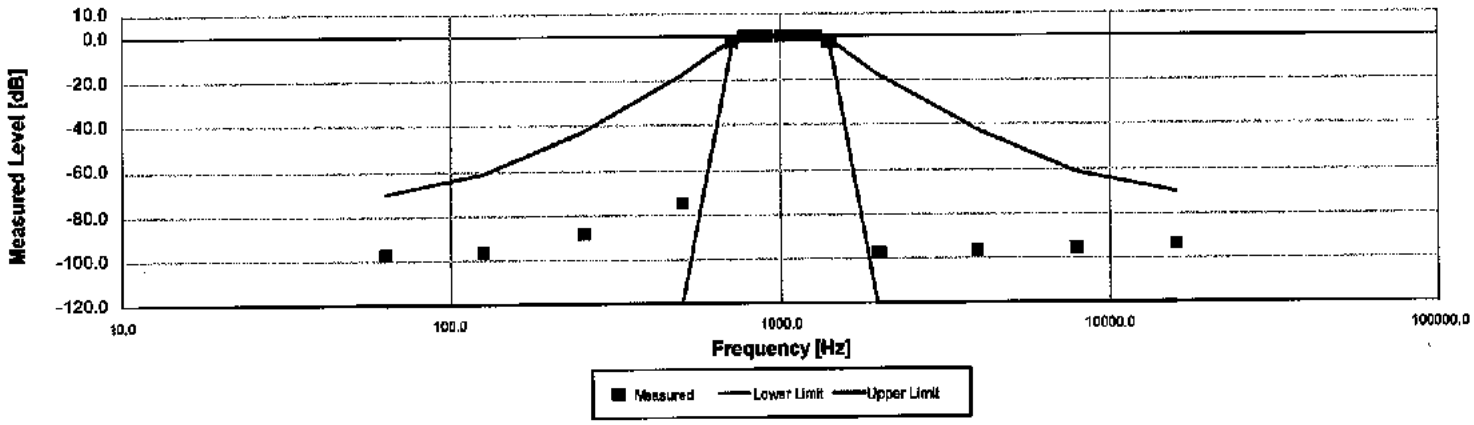
The SLM is set to normal range and 0 dB gain. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
0.50	-101.96	-inf	-70.00	2.40	Pass
1.00	-93.80	-inf	-61.00	2.20	Pass
2.00	-89.14	-inf	-42.00	0.24	Pass
3.98	-75.04	-inf	-17.50	0.23	Pass
5.62	-3.41	-5.00	-2.00	0.09	Pass
6.13	-0.43	-1.30	0.30	0.09	Pass
6.68	-0.18	-0.60	0.30	0.09	Pass
7.29	-0.14	-0.40	0.30	0.09	Pass
7.94	-0.11	-0.30	0.30	0.09	Pass
8.66	-0.07	-0.40	0.30	0.09	Pass
9.44	-0.02	-0.60	0.30	0.09	Pass
10.29	0.02	-1.30	0.30	0.09	Pass
11.22	-3.06	-5.00	-2.00	0.09	Pass
15.85	-106.16	-inf	-17.50	1.30	Pass
31.62	-106.39	-inf	-42.00	1.70	Pass
63.10	-110.94	-inf	-61.00	1.10	Pass
125.89	-103.30	-inf	-70.00	1.80	Pass

-- End of measurement results--

1/1 Octave Filter: 1 kHz



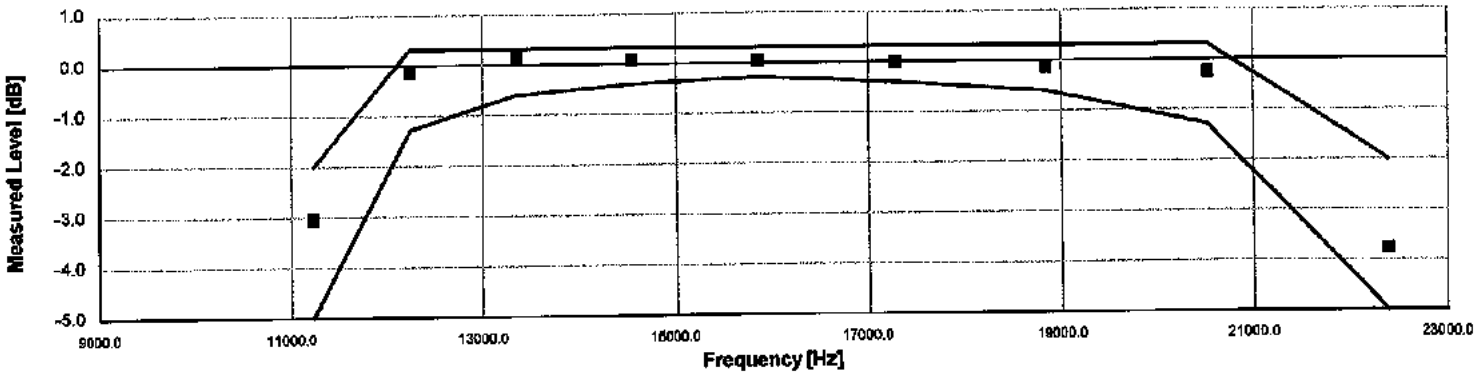


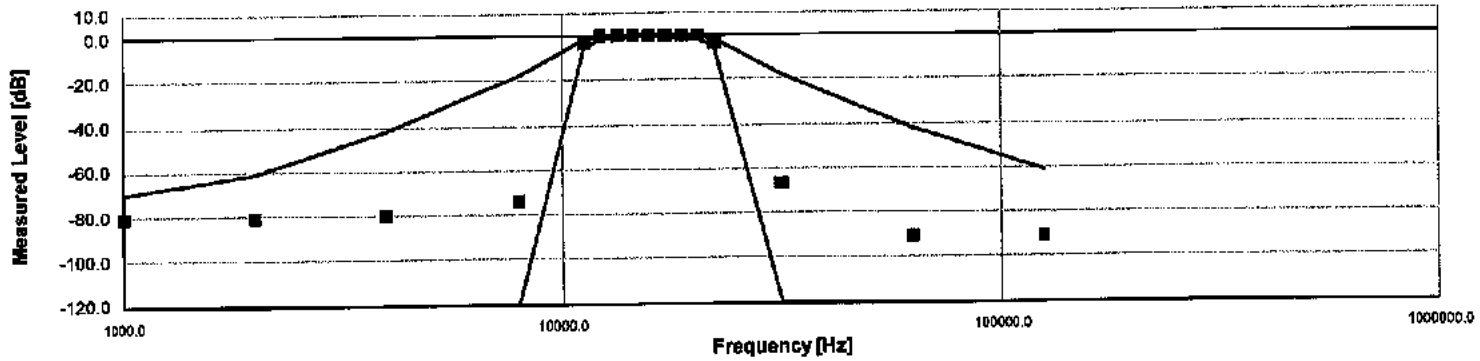
The SLM is set to normal range and 0 dB gain. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
63.10	-96.84	-inf	-70.00	0.28	Pass
125.89	-96.48	-inf	-61.00	0.32	Pass
251.19	-88.19	-inf	-42.00	0.18	Pass
501.19	-74.64	-inf	-17.50	0.09	Pass
707.95	-3.16	-5.00	-2.00	0.09	Pass
771.79	-0.23	-1.30	0.30	0.09	Pass
841.40	-0.03	-0.60	0.30	0.09	Pass
917.28	-0.02	-0.40	0.30	0.09	Pass
1,000.00	0.00	-0.30	0.30	0.09	Pass
1,090.18	-0.03	-0.40	0.30	0.09	Pass
1,188.50	-0.03	-0.60	0.30	0.09	Pass
1,295.69	0.00	-1.30	0.30	0.09	Pass
1,412.54	-3.14	-5.00	-2.00	0.09	Pass
1,995.26	-96.88	-inf	-17.50	0.26	Pass
3,981.07	-96.65	-inf	-42.00	0.26	Pass
7,943.28	-95.74	-inf	-61.00	0.31	Pass
15,848.93	-93.79	-inf	-70.00	0.24	Pass

-- End of measurement results--

1/1 Octave Filter: 16 kHz



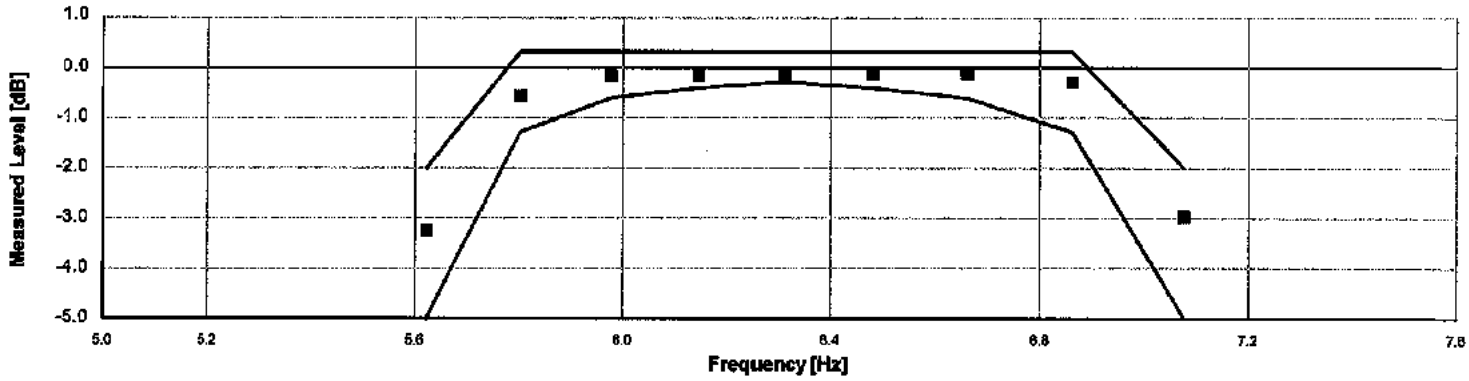


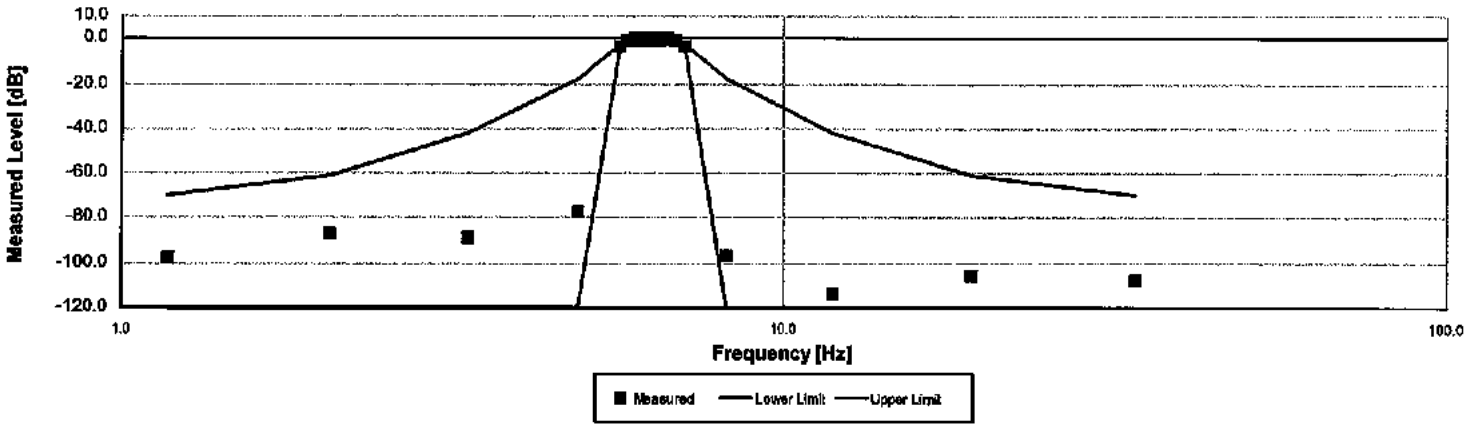
The SLM is set to normal range and 0 dB gain. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
1,000.00	-80.58	-inf	-70.00	0.11	Pass
1,995.26	-80.51	-inf	-61.00	0.09	Pass
3,981.07	-80.30	-inf	-42.00	0.10	Pass
7,943.28	-73.77	-inf	-17.50	0.10	Pass
11,220.18	-3.04	-5.00	-2.00	0.09	Pass
12,232.07	-0.12	-1.30	0.30	0.09	Pass
13,335.21	0.09	-0.60	0.30	0.09	Pass
14,537.84	0.07	-0.40	0.30	0.09	Pass
15,848.93	0.03	-0.30	0.30	0.09	Pass
17,278.26	-0.02	-0.40	0.30	0.09	Pass
18,836.49	-0.14	-0.60	0.30	0.09	Pass
20,535.25	-0.26	-1.30	0.30	0.09	Pass
22,387.21	-3.76	-5.00	-2.00	0.09	Pass
31,622.78	-66.76	-inf	-17.50	0.09	Pass
63,095.73	-90.86	-inf	-42.00	0.10	Pass
125,892.54	-91.09	-inf	-61.00	0.09	Pass

-- End of measurement results--

1/3 Octave Filter: 6.3 Hz



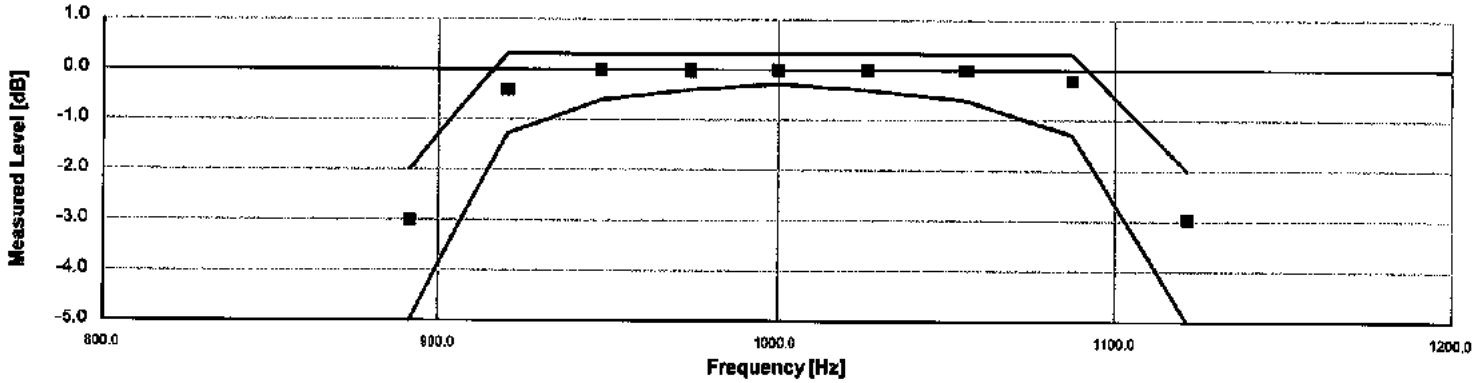


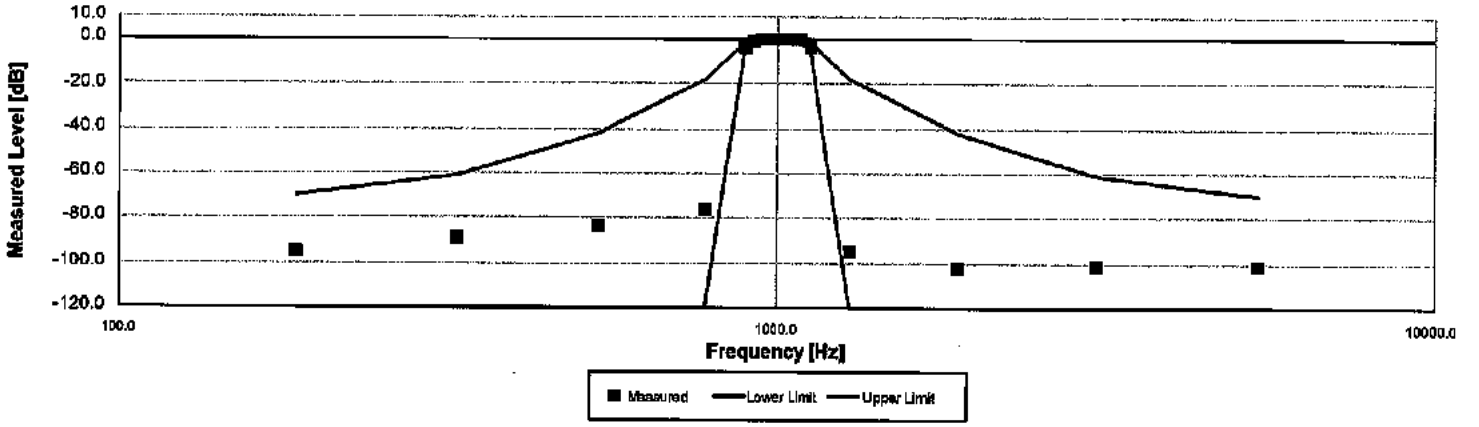
The SLM is set to normal range and 0 dB gain. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
1.17	-97.44	-inf	-70.00	0.36	Pass
2.07	-87.17	-inf	-61.00	0.11	Pass
3.35	-88.21	-inf	-42.00	0.09	Pass
4.87	-76.78	-inf	-17.50	0.10	Pass
5.62	-3.23	-5.00	-2.00	0.09	Pass
5.80	-0.58	-1.30	0.30	0.09	Pass
5.98	-0.16	-0.60	0.30	0.09	Pass
6.15	-0.16	-0.40	0.30	0.09	Pass
6.31	-0.14	-0.30	0.30	0.09	Pass
6.48	-0.13	-0.40	0.30	0.09	Pass
6.66	-0.12	-0.60	0.30	0.09	Pass
6.86	-0.30	-1.30	0.30	0.09	Pass
7.08	-2.95	-5.00	-2.00	0.09	Pass
8.17	-96.74	-inf	-17.50	0.34	Pass
11.87	-113.95	-inf	-42.00	1.70	Pass
19.27	-105.83	-inf	-61.00	2.50	Pass
34.02	-107.82	-inf	-70.00	2.10	Pass

-- End of measurement results--

1/3 Octave Filter: 1 kHz



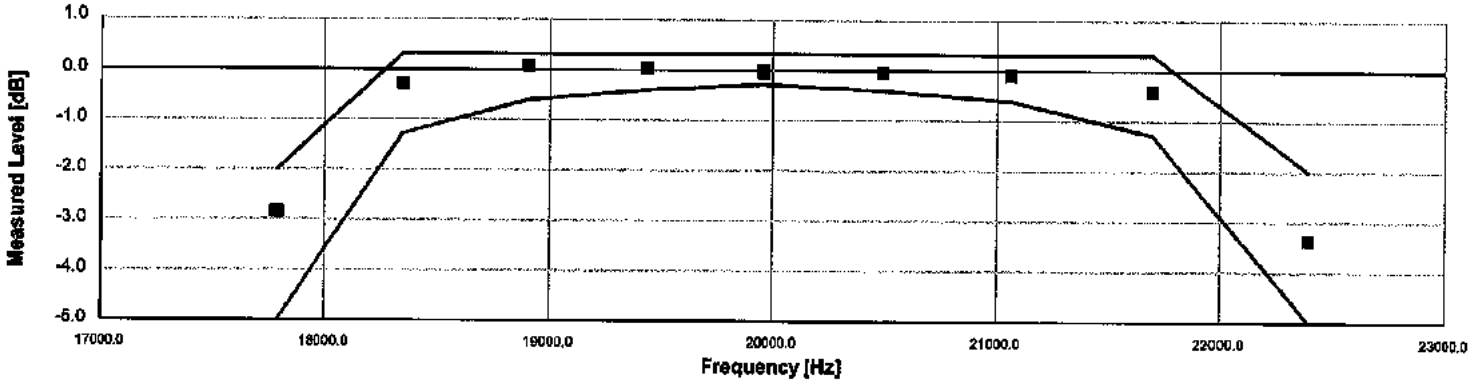


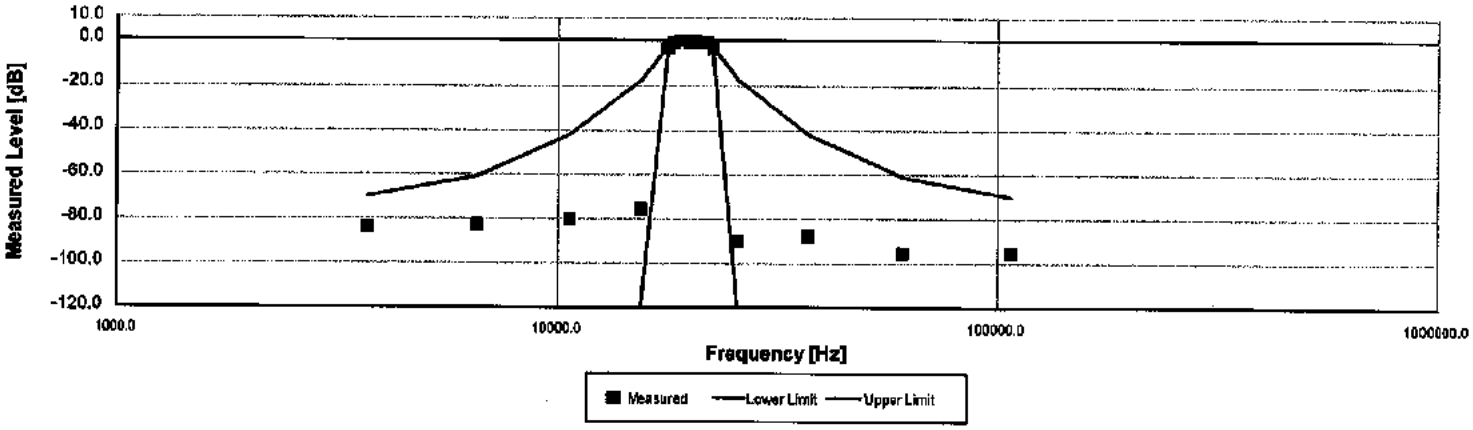
The SLM is set to normal range and 0 dB gain. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
185.46	-95.07	-inf	-70.00	0.17	Pass
327.48	-89.22	-inf	-61.00	0.12	Pass
531.43	-83.10	-inf	-42.00	0.25	Pass
772.57	-76.23	-inf	-17.50	0.09	Pass
891.25	-3.00	-5.00	-2.00	0.09	Pass
919.58	-0.41	-1.30	0.30	0.09	Pass
947.19	0.00	-0.60	0.30	0.09	Pass
974.02	-0.04	-0.40	0.30	0.09	Pass
1,000.00	0.00	-0.30	0.30	0.09	Pass
1,026.67	0.00	-0.40	0.30	0.09	Pass
1,055.75	-0.01	-0.60	0.30	0.09	Pass
1,087.46	-0.23	-1.30	0.30	0.09	Pass
1,122.02	-2.97	-5.00	-2.00	0.09	Pass
1,294.37	-94.99	-inf	-17.50	0.25	Pass
1,881.73	-101.97	-inf	-42.00	0.40	Pass
3,053.65	-101.07	-inf	-61.00	0.44	Pass
5,391.95	-101.01	-inf	-70.00	0.40	Pass

-- End of measurement results--

1/3 Octave Filter: 20 kHz





The SLM is set to normal range and 0 dB gain. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
3,700.45	-83.51	-inf	-70.00	0.11	Pass
6,534.02	-82.27	-inf	-61.00	0.11	Pass
10,603.35	-79.65	-inf	-42.00	0.13	Pass
15,414.88	-75.72	-inf	-17.50	0.09	Pass
17,782.79	-2.83	-5.00	-2.00	0.09	Pass
18,347.97	-0.31	-1.30	0.30	0.09	Pass
18,898.93	0.08	-0.60	0.30	0.09	Pass
19,434.23	0.02	-0.40	0.30	0.09	Pass
19,952.62	-0.03	-0.30	0.30	0.09	Pass
20,484.85	-0.05	-0.40	0.30	0.09	Pass
21,065.07	-0.11	-0.60	0.30	0.09	Pass
21,697.62	-0.41	-1.30	0.30	0.09	Pass
22,387.21	-3.36	-5.00	-2.00	0.09	Pass
25,826.16	-89.51	-inf	-17.50	0.12	Pass
37,545.40	-87.53	-inf	-42.00	0.11	Pass
60,928.37	-94.96	-inf	-61.00	0.12	Pass
107,583.52	-94.92	-inf	-70.00	0.11	Pass

-- End of measurement results--

-- End of Report--

Signatory: *Ron Harris*

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.41311

Instrument: **Microphone**
Model: **377B20**
Manufacturer: **PCB Piezotronics**
Serial number: **110889**
Composed of:

Date Calibrated: **8/15/2018** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No

Customer: **Epsilon Associates, Inc.**
Tel/Fax: **978-461-6235/978-897-0099**
Address: **3 Mill & Main Place, Suite 250**
Maynard, MA 01754

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 2/25/2015

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31061	Jul 30, 2018	Scantek, Inc./ NVLAP	Jul 30, 2019
DS-360-SRS	Function Generator	88077	Sep 15, 2016	ACR Env./ A2LA	Sep 15, 2018
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Sep 20, 2017	ACR Env./ A2LA	Sep 20, 2018
HM30-Thommen	Meteo Station	1040170/39633	Oct 25, 2017	ACR Env./ A2LA	Oct 25, 2018
PC Program 1017 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Nov 10, 2017	Scantek, Inc./ NVLAP	Nov 10, 2018
1203-Norsonic	Preamplifier	92268	Oct 18, 2017	Scantek, Inc./ NVLAP	Oct 18, 2018
4180-Brüel&Kjær	Microphone	2246115	Oct 24, 2017	DANAK / DPLA	Oct 24, 2019

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Jeremy Gotwalt	**Authorized signatory:**	Steven E. Marshall
Signature		Signature	
Date	8/15/18	Date	8/16/2018

Document stored as: Z:\Calibration Lab\Mic 2018\PCB377B20_110889_M1.doc

Results summary: Device was tested and complies with following clauses of mentioned specifications:

CLAUSES / METHODS[1] FROM PROCEDURES		MET[2,3]	NOT MET	NOT TESTED	MEASUREMENT EXPANDED UNCERTAINTY (coverage factor 2)
Open circuit sensitivity (insert voltage method, 250 Hz)		X			See below
Frequency response	Actuator response	X			63 – 200Hz: 0.3 dB 200 – 8000 Hz: 0.2 dB 8 – 10 kHz: 0.5 dB 10 – 20 kHz: 0.7 dB 20 – 50 kHz: 0.9 dB 50 – 100 kHz: 1.2 dB
	FF/Diffuse field responses	X			63 – 200Hz: 0.3 dB 200 – 4000 Hz: 0.2 dB 4 – 10 kHz: 0.6 dB 10 – 20 kHz: 0.9 dB 20 – 50 kHz: 2.2 dB 50 – 100 kHz: 4.4 dB
	Scantek, Inc. acoustical method			X	31.5 – 125 Hz: 0.16 dB 250, 1000 Hz: 0.12 dB 2 – 8 kHz: 0.8 dB 12.5 – 16 kHz: 2.4 dB

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.

[2] Results are normalized to the reference conditions.

[3] The tests marked with (*) are not covered by the current NVLAP accreditation.

Note: The free field/diffuse field characteristics were calculated based on the measured actuator response and adjustment coefficients as provided by the manufacturer. The uncertainties reported for these characteristics may include assumed uncertainty components for the adjustment coefficients.

Comments: The instrument was tested and met all specifications found in the referenced procedures.

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
21.5 ± 1.0	100.09 ± 0.020	48.1 ± 2.0

Main measured parameters:

Tone frequency (Hz)	Measured[4]/Acceptable Open circuit sensitivity (dB re 1V/Pa)	Sensitivity (mV/Pa)
250	-26.99 ± 0.12/ 26.0 ±1.5	44.72

[4] The reported expanded uncertainty is calculated with a coverage factor k=2.00

Tests made with following attachments to instrument and auxiliary devices:

Protection grid mounted for sensitivity measurements
Actuator type: G.R.A.S. RA0014

Measured Data: Found on Microphone Test Report # 41311 of one page.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA

Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.41310

Instrument:	**Sound Level Meter**
Model:	**831**
Manufacturer:	**Larson Davis**
Serial number:	**0001993**
Tested with:	**Microphone 377B20 s/n 110889** **Preamplifier PRM831 s/n 015260**
Type (class):	**1**
Customer:	**Epsilon Associates, Inc.**
Tel/Fax:	**978-461-6235 / 978-897-0099**

Date Calibrated: **8/15/2018** *Cal Due:*

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes X No
Calibration service: __ Basic X Standard
Address: **3 Mill & Main Place, Suite 250**
Maynard, MA 01754

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31061	Jul 30, 2018	Scantek, Inc./ NVLAP	Jul 30, 2019
DS-360-SRS	Function Generator	88077	Sep 15, 2016	ACR Env./ A2LA	Sep 15, 2018
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Sep 20, 2017	ACR Env./ A2LA	Sep 20, 2018
HM30-Thommen	Meteo Station	1040170/39633	Oct 25, 2017	ACR Env./ A2LA	Oct 25, 2018
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 10, 2017	Scantek, Inc./ NVLAP	Nov 10, 2018

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
21.3	100.06	47.2

Calibrated by:	Jeremy Gotwalt	Authorized signatory:	Steven E. Marshall
Signature		Signature	
Date	8/15/18	Date	8/16/2018

Results summary: Device complies with following clauses of mentioned specifications:

CLAUSES[1] FROM IEC/ANSI STANDARDS REFERENCED IN PROCEDURES:	RESULT[2,3]	EXPANDED UNCERTAINTY (coverage factor 2) [dB]
INDICATION AT THE CALIBRATION CHECK FREQUENCY - IEC61672-3 ED.2 CLAUSE 10	Passed	0.15
SELF-GENERATED NOISE - IEC 61672-3 ED.2 CLAUSE 11	Passed	0.3
FREQUENCY WEIGHTINGS: A NETWORK - IEC 61672-3 ED.2.0 CLAUSE 13	Passed	0.2
FREQUENCY WEIGHTINGS: C NETWORK - IEC 61672-3 ED.2.0 CLAUSE 13	Passed	0.2
FREQUENCY WEIGHTINGS: Z NETWORK - IEC 61672-3 ED.2.0 CLAUSE 13	Passed	0.2
FREQUENCY AND TIME WEIGHTINGS AT 1 KHZ IEC 61672-3 ED.2.0 CLAUSE 14	Passed	0.2
LEVEL LINEARITY ON THE REFERENCE LEVEL RANGE - IEC 61672-3 ED.2 CLAUSE 16	Passed	0.25
LEVEL LINEARITY INCLUDING THE LEVEL RANGE CONTROL - IEC 61672-3 ED.2.0 CLAUSE 17	Passed	0.25
TONEBURST RESPONSE - IEC 61672-3 ED.2.0 CLAUSE 18	Passed	0.3
PEAK C SOUND LEVEL - IEC 61672-3 ED.2.0 CLAUSE 19	Passed	0.35
OVERLOAD INDICATION - IEC 61672-3 ED.2.0 CLAUSE 20	Passed	0.25
HIGH LEVEL STABILITY TEST - IEC 61672-3 ED.2.0 CLAUSE 21	Passed	0.1
LONG TERM STABILITY TEST - IEC 61672-3 ED.2.0 CLAUSE 15	Passed	0.1
FILTER TEST 1/1OCTAVE: RELATIVE ATTENUATION - IEC 61260, CLAUSE 4.4 & #5.3	Passed	0.25
FILTER TEST 1/3OCTAVE: RELATIVE ATTENUATION - IEC 61260, CLAUSE 4.4 & #5.3	Passed	0.25
COMBINED ELECTRICAL AND ACOUSTICAL TEST - IEC 61672-3 ED.2.0 CLAUSE 13	Passed	See test report

1 The results of this calibration apply only to the instrument type with serial number identified in this report.

2 Parameters are certified at actual environmental conditions.

3 The tests marked with (*) are not covered by the current NVLAP accreditation.

Comments: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2, to demonstrate that the model of sound level meter fully conforms to the requirements in the IEC 61672-2, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1.

Note: The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

Tests made with the following attachments to the instrument:

Microphone: PCB Piezotronics 377B20 s/n 110889 for acoustical test
Preamplifier: Larson Davis PRM831 s/n 0001993 for all tests
Other: line adaptor ADP005 (18pF) for electrical tests
Accompanying acoustical calibrator: none
Windscreen: none

Measured Data: in Test Report # 41310 of 9+1 pages.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA

Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Calibration Certificate

Certificate Number 2017011095

Customer:
Epsilon Associates Inc
Suite 250
3 Clock Tower Place
Maynard, MA 01754, United States

Model Number	377C20	***Procedure Number***	D0001.8387		
Serial Number	165015	***Technician***	Abraham Ortega		
Test Results	**Pass**	***Calibration Date***	19 Oct 2017		
Initial Condition	As Manufactured	***Calibration Due***	19 Oct 2018		
Description	1/2 inch Microphone - RI - 0V	***Temperature***	23.5	°C	± 0.01 °C
		Humidity	28.2	%RH	± 0.5 %RH
		Static Pressure	101.27	kPa	± 0.03 kPa

Evaluation Method Tested electrically using an electrostatic actuator.

Compliance Standards Compliant to Manufacturer Specifications.

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis Model 2900 Real Time Analyzer	07/17/2017	07/17/2018	001230
Microphone Calibration System	08/30/2017	08/30/2018	001233
1/2" Preamplifier	12/15/2016	12/15/2017	001274
Agilent 34401A DMM	12/06/2016	12/06/2017	001329
Larson Davis CAL250 Acoustic Calibrator	01/04/2017	01/04/2018	003030
1/2" Preamplifier	04/12/2017	04/12/2018	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	09/12/2017	09/12/2018	006507
1/2 inch Microphone - RI - 200V	04/24/2017	04/24/2018	006510
1/2 inch Microphone - RI - 200V	08/09/2017	08/09/2018	006519
Larson Davis 1/2" Preamplifier 7-pin LEMO	09/12/2017	09/12/2018	006530
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/11/2017	08/11/2018	006531

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Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

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Sensitivity

Measurement	Test Result [mV/Pa]	Lower limit [mV/Pa]	Upper limit [mV/Pa]	Expanded Uncertainty [mV/Pa]	Result
Open Circuit Sensitivity	43.80	42.17	59.57	1.00	Pass

-- End of measurement results--

Capacitance

Measurement	Test Result [pF]				
Capacitance	12.00			‡	

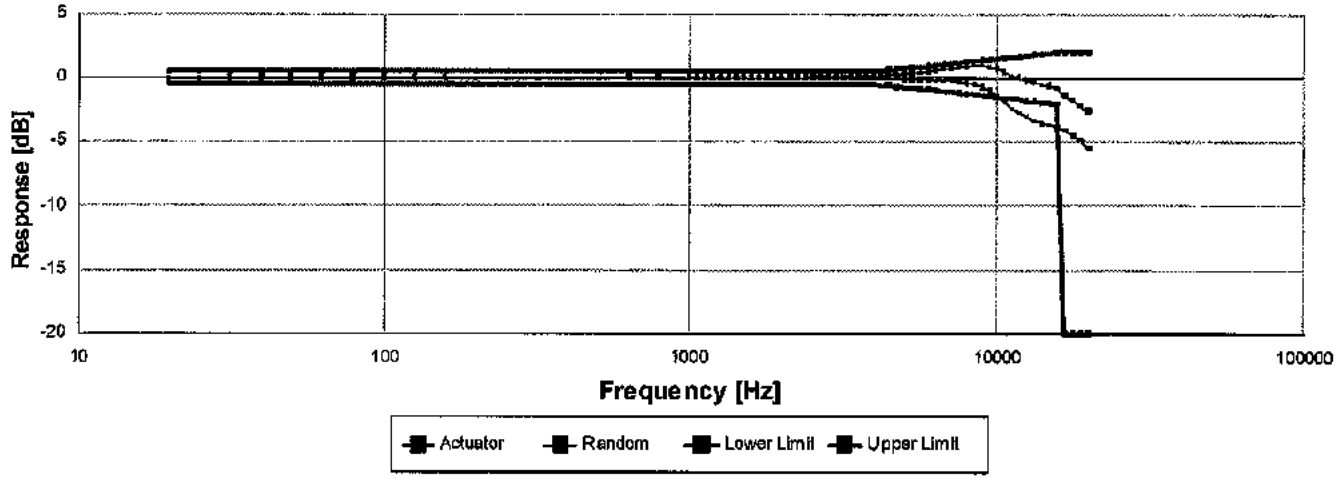
-- End of measurement results--

Lower Limiting Frequency

Measurement	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Result
-3 dB Frequency	2.17	1.00	2.40	Pass ‡

-- End of measurement results--

Frequency Response



Data is normalized for 0 dB @ 251.19 Hz.

Frequency [Hz]	Actuator [dB]	Random [dB]	Lower limit [dB]	Upper limit [dB]	Result
19.95	-0.02	-0.02	-0.50	0.50	Pass ‡
25.12	0.00	0.00	-0.50	0.50	Pass ‡
31.62	0.02	0.02	-0.50	0.50	Pass ‡
39.81	0.02	0.02	-0.50	0.50	Pass ‡
50.12	0.02	0.02	-0.50	0.50	Pass ‡
63.10	0.02	0.02	-0.50	0.50	Pass ‡
79.43	0.02	0.02	-0.50	0.50	Pass ‡
100.00	0.01	0.01	-0.50	0.50	Pass ‡
125.89	0.01	0.01	-0.50	0.50	Pass ‡
158.49	0.01	0.01	-0.50	0.50	Pass ‡
199.53	0.00	0.00	-0.50	0.50	Pass ‡

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Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3822.01

LARSON DAVIS
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Frequency [Hz]	Actuator [dB]	Random [dB]	Lower limit [dB]	Upper limit [dB]	Result
251.19	0.00	0.00	-0.50	0.50	Pass ‡
316.23	-0.01	0.00	-0.50	0.50	Pass ‡
398.11	-0.01	0.00	-0.50	0.50	Pass ‡
501.19	-0.01	0.00	-0.50	0.50	Pass ‡
630.96	-0.02	0.16	-0.50	0.50	Pass ‡
794.33	-0.01	0.01	-0.50	0.50	Pass ‡
1,000.00	-0.02	0.01	-0.50	0.50	Pass ‡
1,059.25	-0.02	0.01	-0.50	0.50	Pass ‡
1,122.02	-0.02	0.01	-0.50	0.50	Pass ‡
1,188.50	-0.02	0.01	-0.50	0.50	Pass ‡
1,258.93	-0.02	0.01	-0.50	0.50	Pass ‡
1,333.52	-0.03	0.01	-0.50	0.50	Pass ‡
1,412.54	-0.03	0.01	-0.50	0.50	Pass ‡
1,496.24	-0.03	0.01	-0.50	0.50	Pass ‡
1,584.89	-0.03	0.01	-0.50	0.50	Pass ‡
1,678.80	-0.03	0.01	-0.50	0.50	Pass ‡
1,778.28	-0.03	0.01	-0.50	0.50	Pass ‡
1,883.65	-0.03	0.02	-0.50	0.50	Pass ‡
1,995.26	-0.03	0.02	-0.50	0.50	Pass ‡
2,113.49	-0.03	0.02	-0.50	0.50	Pass ‡
2,238.72	-0.03	0.03	-0.50	0.50	Pass ‡
2,371.37	-0.02	0.04	-0.50	0.50	Pass ‡
2,511.89	-0.02	0.05	-0.50	0.50	Pass ‡
2,660.73	-0.02	0.05	-0.50	0.50	Pass ‡
2,818.38	-0.02	0.06	-0.50	0.50	Pass ‡
2,985.38	-0.03	0.06	-0.50	0.50	Pass ‡
3,162.28	-0.03	0.08	-0.50	0.50	Pass ‡
3,349.65	-0.02	0.10	-0.50	0.50	Pass ‡
3,548.13	-0.04	0.10	-0.50	0.50	Pass ‡
3,758.37	-0.04	0.12	-0.50	0.50	Pass ‡
3,981.07	-0.04	0.15	-0.50	0.50	Pass ‡
4,216.97	-0.04	0.19	-0.63	0.56	Pass ‡
4,466.84	-0.05	0.23	-0.60	0.63	Pass ‡
4,731.51	-0.06	0.27	-0.70	0.69	Pass ‡
5,011.87	-0.07	0.32	-0.80	0.75	Pass ‡
5,308.84	-0.08	0.38	-0.80	0.81	Pass ‡
5,623.41	-0.09	0.45	-0.90	0.88	Pass ‡
5,956.62	-0.11	0.52	-0.90	0.94	Pass ‡
6,309.57	-0.13	0.61	-1.00	1.00	Pass ‡
6,683.44	-0.17	0.69	-1.10	1.06	Pass ‡
7,079.46	-0.21	0.79	-1.10	1.13	Pass ‡
7,498.94	-0.29	0.87	-1.20	1.19	Pass ‡
7,943.28	-0.39	0.94	-1.30	1.25	Pass ‡
8,413.95	-0.51	1.01	-1.30	1.31	Pass ‡
8,912.51	-0.70	1.02	-1.40	1.38	Pass ‡
9,440.61	-1.03	0.89	-1.40	1.43	Pass ‡
10,000.00	-1.38	0.76	-1.50	1.50	Pass ‡
10,592.54	-1.85	0.50	-1.60	1.56	Pass ‡
11,220.19	-2.43	0.13	-1.60	1.63	Pass ‡
11,885.02	-2.72	0.02	-1.70	1.68	Pass ‡
12,589.25	-3.07	-0.17	-1.80	1.75	Pass ‡
13,335.21	-3.33	-0.32	-1.80	1.81	Pass ‡
14,125.38	-3.54	-0.47	-1.90	1.87	Pass ‡

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3822.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Frequency [Hz]	Actuator [dB]	Random [dB]	Lower limit [dB]	Upper limit [dB]	Result
14,962.36	-3.65	-0.58	-1.93	1.93	Pass ‡
15,848.93	-3.83	-0.82	-2.00	2.00	Pass ‡
16,788.04	-4.12	-1.34		2.00	Pass ‡
17,782.80	-4.44	-1.66		2.00	Pass ‡
18,836.49	-4.85	-2.12		2.00	Pass ‡
19,952.62	-5.44	-2.54		2.00	Pass ‡

-- End of measurement results--

Signatory: Abraham Ortega

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Calibration Certificate

Certificate Number 2017010814

Customer:

Epsilon Associates Inc
Suite 250
3 Clock Tower Place
Maynard, MA 01754, United States

Model Number	831	***Procedure Number***	D0001.8378	
Serial Number	0003752	***Technician***	Ron Harris	
Test Results	**Pass**	***Calibration Date***	12 Oct 2017	
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	12 Oct 2018	
Description	Larson Davis Model 831 Class 1 Sound Level Meter Firmware Revision: 2.314	***Temperature***	23.59 °C	± 0.25 °C
		Humidity	50.5 %RH	± 2.0 %RH
		Static Pressure	86.47 kPa	± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRM831 S/N 029563 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 50.0 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61252:2002	ANSI S1.11 (R2009) Class 1
IEC 61260:2001 Class 1	ANSI S1.25 (R2007)
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Correction data from Larson Davis Model 831 Sound Level Meter Manual, I831.01 Rev O, 2016-09-19

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa; Reference Range: 0 dB gain

Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part3.

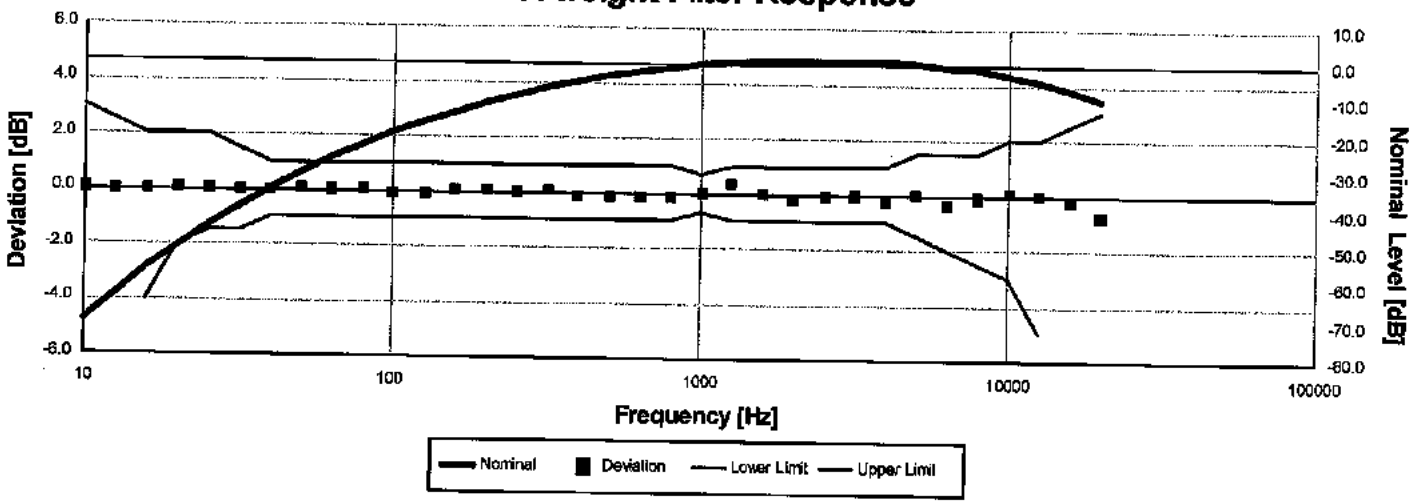
Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 successfully completed by Physikalisch-Technische Bundesanstalt (PTB) on 2016-02-24 certificate number DE-15-M-PTB-0056.

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part 3, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organization responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013 / ANSI/ASA S1.4-2014/Part 2, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1; the sound level meter submitted for testing conforms to the class 1specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
SRS DS360 Ultra Low Distortion Generator	2017-01-19	2018-01-19	006239
Hart Scientific 2626-S Humidity/Temperature Sensor	2017-06-11	2018-06-11	006943

A-weight Filter Response

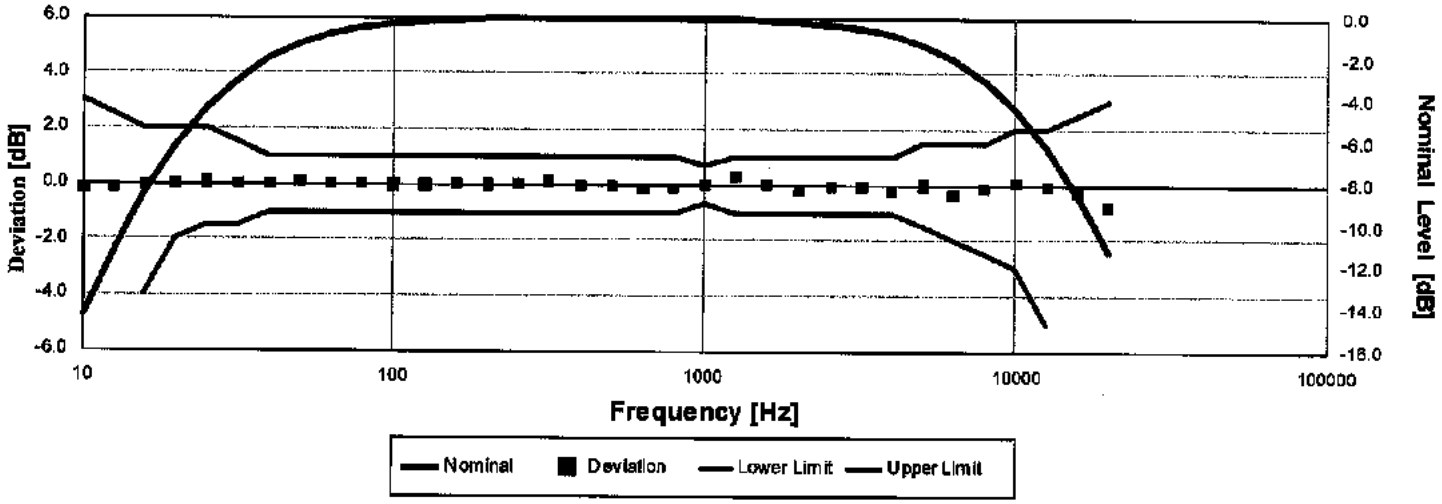


Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
10.00	-70.35	0.05	-inf	3.00	0.22	Pass
12.59	-63.42	-0.02	-inf	2.50	0.22	Pass
15.85	-56.70	0.00	-4.00	2.00	0.22	Pass
19.95	-50.40	0.10	-2.00	2.00	0.22	Pass
25.12	-44.66	0.04	-1.50	2.00	0.22	Pass
31.62	-39.40	0.00	-1.50	1.50	0.22	Pass
39.81	-34.61	-0.01	-1.00	1.00	0.22	Pass
50.12	-30.12	0.08	-1.00	1.00	0.22	Pass
63.10	-26.15	0.05	-1.00	1.00	0.22	Pass
79.43	-22.45	0.05	-1.00	1.00	0.22	Pass
100.00	-19.16	-0.06	-1.00	1.00	0.22	Pass
125.89	-16.14	-0.04	-1.00	1.00	0.22	Pass
158.49	-13.32	0.08	-1.00	1.00	0.22	Pass
199.53	-10.84	0.06	-1.00	1.00	0.22	Pass
251.19	-8.59	0.01	-1.00	1.00	0.22	Pass
316.23	-6.49	0.11	-1.00	1.00	0.22	Pass
398.11	-4.92	-0.12	-1.00	1.00	0.22	Pass
501.19	-3.34	-0.14	-1.00	1.00	0.22	Pass
630.96	-2.04	-0.14	-1.00	1.00	0.22	Pass
794.33	-0.96	-0.16	-1.00	1.00	0.22	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.22	Pass
1,258.93	0.96	0.36	-1.00	1.00	0.22	Pass
1,584.89	1.01	0.01	-1.00	1.00	0.22	Pass
1,995.26	0.97	-0.23	-1.00	1.00	0.22	Pass
2,511.89	1.23	-0.07	-1.00	1.00	0.22	Pass
3,162.28	1.17	-0.03	-1.00	1.00	0.22	Pass
3,981.07	0.79	-0.21	-1.00	1.00	0.22	Pass
5,011.87	0.53	0.03	-1.50	1.50	0.22	Pass
6,309.57	-0.46	-0.36	-2.00	1.50	0.22	Pass
7,943.28	-1.20	-0.10	-2.50	1.50	0.22	Pass
10,000.00	-2.40	0.10	-3.00	2.00	0.22	Pass
12,589.25	-4.30	0.00	-5.00	2.00	0.22	Pass
15,848.93	-6.80	-0.20	-16.00	2.50	0.22	Pass
19,952.62	-10.05	-0.75	-inf	3.00	0.22	Pass

-- End of measurement results--

C-weight Filter Response

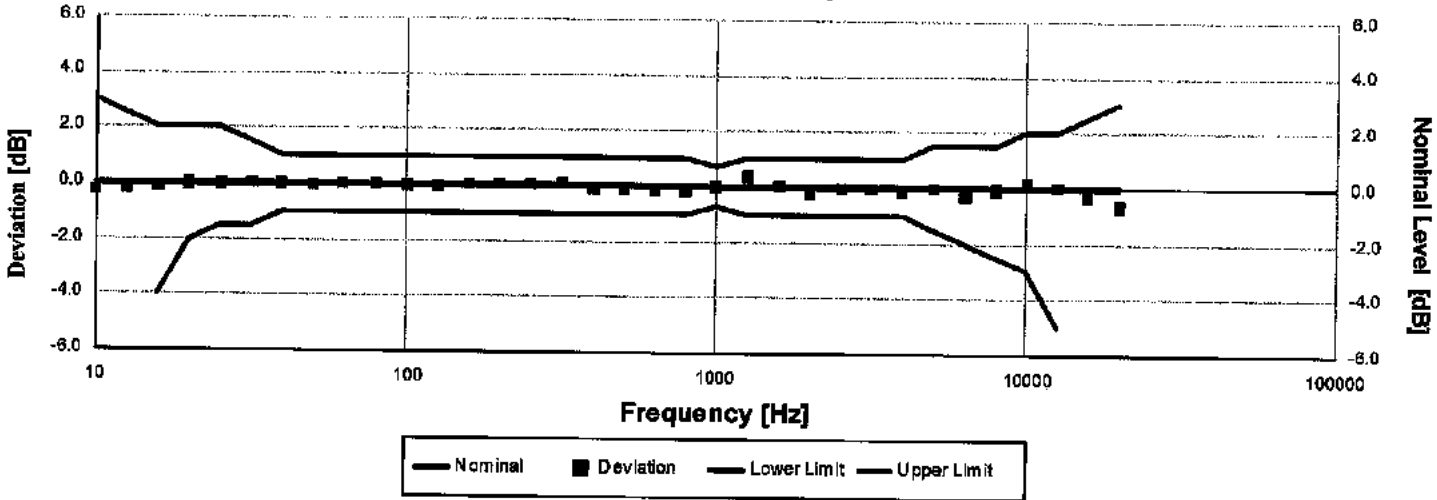


Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
10.00	-14.47	-0.17	-inf	3.00	0.22	Pass
12.59	-11.33	-0.13	-inf	2.50	0.22	Pass
15.85	-8.54	-0.04	-4.00	2.00	0.22	Pass
19.95	-6.18	0.02	-2.00	2.00	0.22	Pass
25.12	-4.36	0.04	-1.50	2.00	0.22	Pass
31.62	-2.97	0.03	-1.50	1.50	0.22	Pass
39.81	-1.98	0.02	-1.00	1.00	0.22	Pass
50.12	-1.23	0.07	-1.00	1.00	0.22	Pass
63.10	-0.78	0.02	-1.00	1.00	0.22	Pass
79.43	-0.46	0.04	-1.00	1.00	0.22	Pass
100.00	-0.32	-0.02	-1.00	1.00	0.22	Pass
125.89	-0.22	-0.02	-1.00	1.00	0.22	Pass
158.49	-0.07	0.03	-1.00	1.00	0.22	Pass
199.53	-0.01	-0.01	-1.00	1.00	0.22	Pass
251.19	0.03	0.03	-1.00	1.00	0.22	Pass
316.23	0.13	0.13	-1.00	1.00	0.22	Pass
398.11	-0.08	-0.08	-1.00	1.00	0.22	Pass
501.19	-0.07	-0.07	-1.00	1.00	0.22	Pass
630.96	-0.12	-0.12	-1.00	1.00	0.22	Pass
794.33	-0.13	-0.13	-1.00	1.00	0.22	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.22	Pass
1,258.93	0.32	0.32	-1.00	1.00	0.22	Pass
1,584.89	-0.07	0.03	-1.00	1.00	0.22	Pass
1,995.26	-0.41	-0.21	-1.00	1.00	0.22	Pass
2,511.89	-0.35	-0.05	-1.00	1.00	0.22	Pass
3,162.28	-0.54	-0.04	-1.00	1.00	0.22	Pass
3,981.07	-1.01	-0.21	-1.00	1.00	0.22	Pass
5,011.87	-1.32	-0.02	-1.50	1.50	0.22	Pass
6,309.57	-2.34	-0.34	-2.00	1.50	0.22	Pass
7,943.28	-3.11	-0.11	-2.50	1.50	0.22	Pass
10,000.00	-4.32	0.08	-3.00	2.00	0.22	Pass
12,589.25	-6.23	-0.03	-5.00	2.00	0.22	Pass
15,848.93	-8.74	-0.24	-16.00	2.50	0.22	Pass
19,952.62	-12.00	-0.80	-inf	3.00	0.22	Pass

-- End of measurement results--

Z-weight Filter Response



Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
10.00	-0.26	-0.26	-inf	3.00	0.22	Pass
12.59	-0.15	-0.15	-inf	2.50	0.22	Pass
15.85	-0.10	-0.10	-4.00	2.00	0.22	Pass
19.95	-0.01	-0.01	-2.00	2.00	0.22	Pass
25.12	-0.01	-0.01	-1.50	2.00	0.22	Pass
31.62	0.00	0.01	-1.50	1.50	0.22	Pass
39.81	-0.01	-0.01	-1.00	1.00	0.22	Pass
50.12	-0.02	-0.02	-1.00	1.00	0.22	Pass
63.10	0.03	0.03	-1.00	1.00	0.22	Pass
79.43	0.04	0.04	-1.00	1.00	0.22	Pass
100.00	-0.01	-0.01	-1.00	1.00	0.22	Pass
125.89	-0.05	-0.05	-1.00	1.00	0.22	Pass
158.49	0.02	0.02	-1.00	1.00	0.22	Pass
199.53	0.02	0.02	-1.00	1.00	0.22	Pass
251.19	0.03	0.03	-1.00	1.00	0.22	Pass
316.23	0.11	0.11	-1.00	1.00	0.22	Pass
398.11	-0.11	-0.11	-1.00	1.00	0.22	Pass
501.19	-0.11	-0.11	-1.00	1.00	0.22	Pass
630.96	-0.15	-0.15	-1.00	1.00	0.22	Pass
794.33	-0.15	-0.15	-1.00	1.00	0.22	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.22	Pass
1,258.93	0.36	0.36	-1.00	1.00	0.22	Pass
1,584.89	0.01	0.01	-1.00	1.00	0.22	Pass
1,995.26	-0.25	-0.25	-1.00	1.00	0.22	Pass
2,511.89	-0.06	-0.06	-1.00	1.00	0.22	Pass
3,162.28	-0.06	-0.06	-1.00	1.00	0.22	Pass
3,981.07	-0.21	-0.21	-1.00	1.00	0.22	Pass
5,011.87	-0.04	-0.04	-1.50	1.50	0.22	Pass
6,309.57	-0.35	-0.35	-2.00	1.50	0.22	Pass
7,943.28	-0.07	-0.07	-2.50	1.50	0.22	Pass
10,000.00	0.14	0.14	-3.00	2.00	0.22	Pass
12,589.25	0.01	0.01	-5.00	2.00	0.22	Pass
15,848.93	-0.35	-0.35	-16.00	2.50	0.22	Pass
19,952.62	-0.66	-0.66	-inf	3.00	0.22	Pass

-- End of measurement results--

High Level Stability

Electrical signal test of high level stability performed according to IEC 61672-3:2013 21 and ANSI S1.4-2014 Part 3: 21 for compliance to IEC 61672-1:2013 5.15 and ANSI S1.4-2014 Part 1: 5.15

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
High Level Stability	0.00	-0.10	0.10	0.01	Pass

-- End of measurement results--

Long-Term Stability

Electrical signal test of long term stability performed according to IEC 61672-3:2013 15 and ANSI S1.4-2014 Part 3: 15 for compliance to ISC 61672-1:2013 5.14 and ANSI S1.4-2014 Part 1: 5.14

Test Duration [min]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
34	0.03	-0.10	0.10	0.01	Pass

-- End of measurement results--

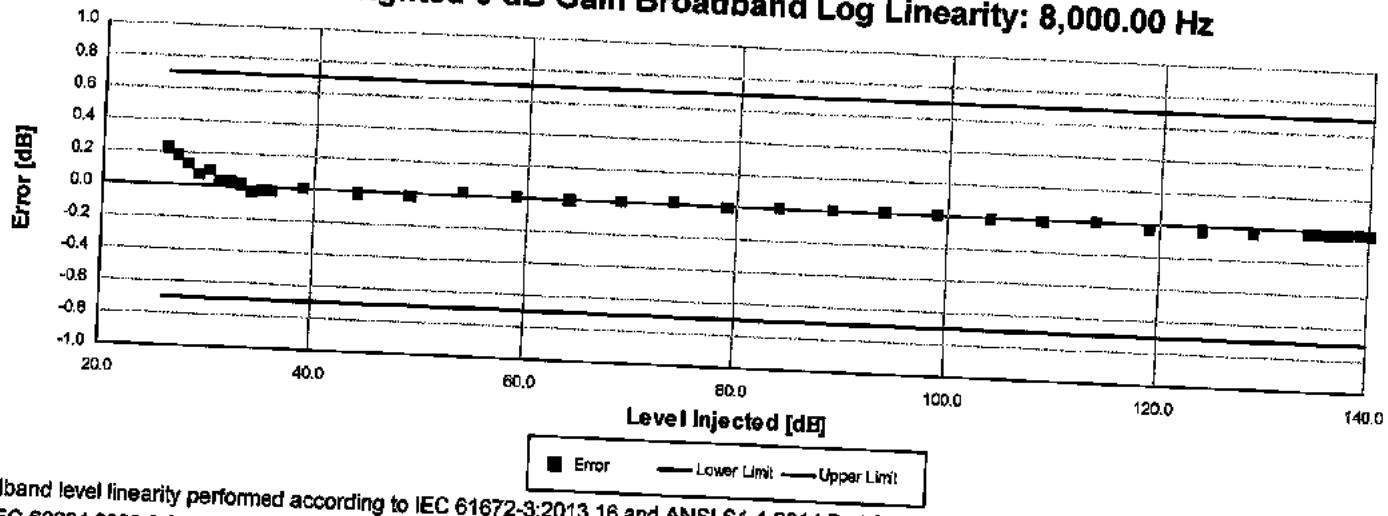
1 kHz Reference Levels

Frequency weightings and time weightings at 1 kHz (reference is A weighted Fast) performed according to IEC 61672-3:2013 14 and ANSI S1.4-2014 Part 3: 14 for compliance to IEC 61672-1:2013 5.5.9 and 5.8.3 and ANSI S1.4-2014 Part 1: 5.5.9 and 5.8.3

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
C weight	113.98	113.78	114.18	0.09	Pass
Z weight	113.97	113.78	114.18	0.09	Pass
Slow	113.98	113.88	114.08	0.09	Pass
Impulse	113.98	113.88	114.08	0.09	Pass

-- End of measurement results--

A-weighted 0 dB Gain Broadband Log Linearity: 8,000.00 Hz



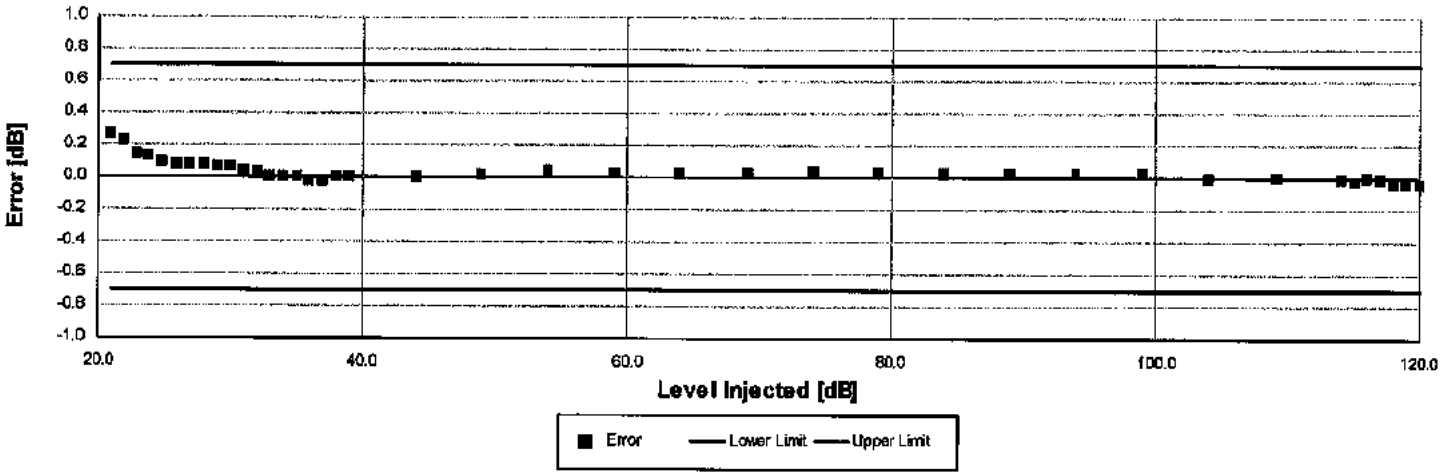
Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6, IEC 60804:2000 6.2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6.9, ANSI S1.4-2014 Part 1: 5.6, ANSI S1.43 (R2007) 6.2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
26.00	0.22	-0.70	0.70	0.09	Pass
27.00	0.18	-0.70	0.70	0.09	Pass
28.00	0.13	-0.70	0.70	0.09	Pass
29.00	0.07	-0.70	0.70	0.09	Pass
30.00	0.09	-0.70	0.70	0.09	Pass
31.00	0.03	-0.70	0.70	0.09	Pass
32.00	0.02	-0.70	0.70	0.09	Pass
33.00	0.01	-0.70	0.70	0.09	Pass
34.00	-0.03	-0.70	0.70	0.09	Pass
35.00	-0.02	-0.70	0.70	0.09	Pass
36.00	-0.02	-0.70	0.70	0.09	Pass
39.00	0.01	-0.70	0.70	0.09	Pass
44.00	-0.01	-0.70	0.70	0.09	Pass
49.00	-0.02	-0.70	0.70	0.09	Pass
54.00	0.01	-0.70	0.70	0.09	Pass
59.00	0.00	-0.70	0.70	0.09	Pass
64.00	0.00	-0.70	0.70	0.09	Pass
69.00	0.01	-0.70	0.70	0.09	Pass
74.00	0.02	-0.70	0.70	0.09	Pass
79.00	0.00	-0.70	0.70	0.09	Pass
84.00	0.00	-0.70	0.70	0.09	Pass
89.00	0.01	-0.70	0.70	0.09	Pass
94.00	0.01	-0.70	0.70	0.09	Pass
99.00	0.01	-0.70	0.70	0.09	Pass
104.00	-0.01	-0.70	0.70	0.09	Pass
109.00	0.00	-0.70	0.70	0.09	Pass
114.00	0.00	-0.70	0.70	0.09	Pass
119.00	-0.03	-0.70	0.70	0.09	Pass
124.00	-0.03	-0.70	0.70	0.09	Pass
129.00	-0.03	-0.70	0.70	0.09	Pass
134.00	-0.02	-0.70	0.70	0.09	Pass
135.00	-0.02	-0.70	0.70	0.09	Pass
136.00	-0.02	-0.70	0.70	0.09	Pass
137.00	-0.02	-0.70	0.70	0.09	Pass
138.00	-0.02	-0.70	0.70	0.09	Pass
139.00	-0.02	-0.70	0.70	0.09	Pass

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140.00	-0.02	-0.70	0.70	0.09	Pass

– End of measurement results–

A-weighted 20 dB Gain Broadband Log Linearity: 8,000.00 Hz



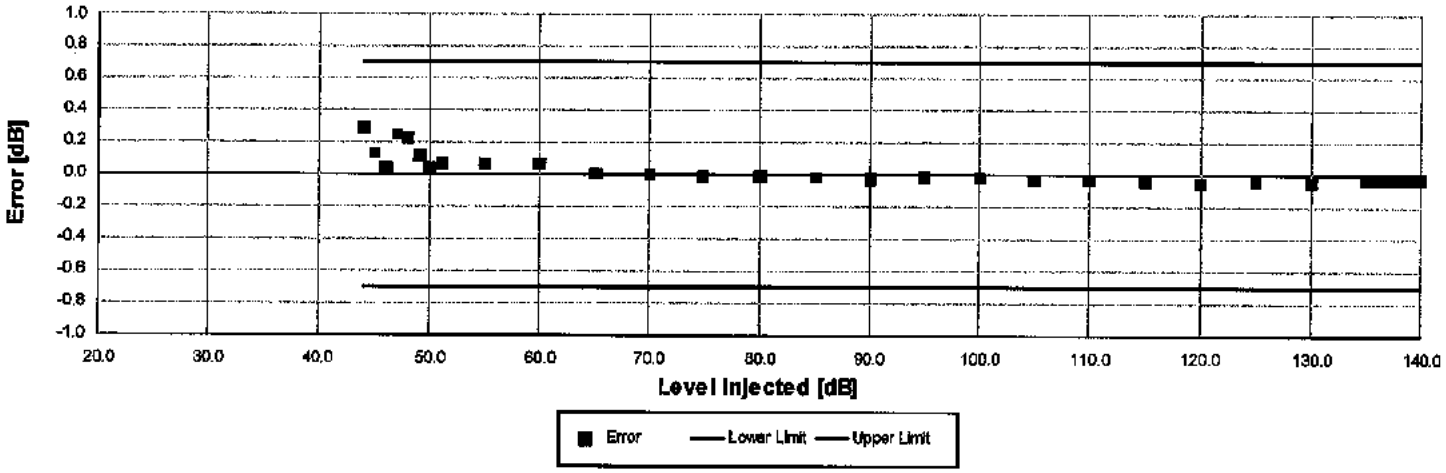
Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6, IEC 60804:2000 6.2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6.9, ANSI S1.4-2014 Part 1: 5.6, ANSI S1.43 (R2007) 6.2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
21.00	0.26	-0.70	0.70	0.09	Pass
22.00	0.22	-0.70	0.70	0.09	Pass
23.00	0.14	-0.70	0.70	0.09	Pass
24.00	0.13	-0.70	0.70	0.09	Pass
25.00	0.09	-0.70	0.70	0.09	Pass
26.00	0.07	-0.70	0.70	0.09	Pass
27.00	0.08	-0.70	0.70	0.09	Pass
28.00	0.08	-0.70	0.70	0.09	Pass
29.00	0.06	-0.70	0.70	0.09	Pass
30.00	0.06	-0.70	0.70	0.09	Pass
31.00	0.05	-0.70	0.70	0.09	Pass
32.00	0.03	-0.70	0.70	0.09	Pass
33.00	0.01	-0.70	0.70	0.09	Pass
34.00	0.01	-0.70	0.70	0.09	Pass
35.00	0.01	-0.70	0.70	0.09	Pass
36.00	-0.02	-0.70	0.70	0.09	Pass
37.00	-0.02	-0.70	0.70	0.09	Pass
38.00	0.00	-0.70	0.70	0.09	Pass
39.00	0.00	-0.70	0.70	0.09	Pass
44.00	0.01	-0.70	0.70	0.09	Pass
49.00	0.01	-0.70	0.70	0.09	Pass
54.00	0.04	-0.70	0.70	0.09	Pass
59.00	0.02	-0.70	0.70	0.09	Pass
64.00	0.02	-0.70	0.70	0.09	Pass
69.00	0.03	-0.70	0.70	0.09	Pass
74.00	0.04	-0.70	0.70	0.09	Pass
79.00	0.02	-0.70	0.70	0.09	Pass
84.00	0.03	-0.70	0.70	0.09	Pass
89.00	0.03	-0.70	0.70	0.09	Pass
94.00	0.03	-0.70	0.70	0.09	Pass
99.00	0.03	-0.70	0.70	0.09	Pass
104.00	-0.01	-0.70	0.70	0.09	Pass
109.00	0.00	-0.70	0.70	0.09	Pass
114.00	-0.01	-0.70	0.70	0.09	Pass
115.00	-0.03	-0.70	0.70	0.09	Pass
116.00	0.01	-0.70	0.70	0.09	Pass

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
117.00	-0.01	-0.70	0.70	0.09	Pass
118.00	-0.03	-0.70	0.70	0.09	Pass
119.00	-0.03	-0.70	0.70	0.09	Pass
120.00	-0.04	-0.70	0.70	0.09	Pass

-- End of measurement results--

1/1 Octave Log Linearity: 1,000.00 Hz

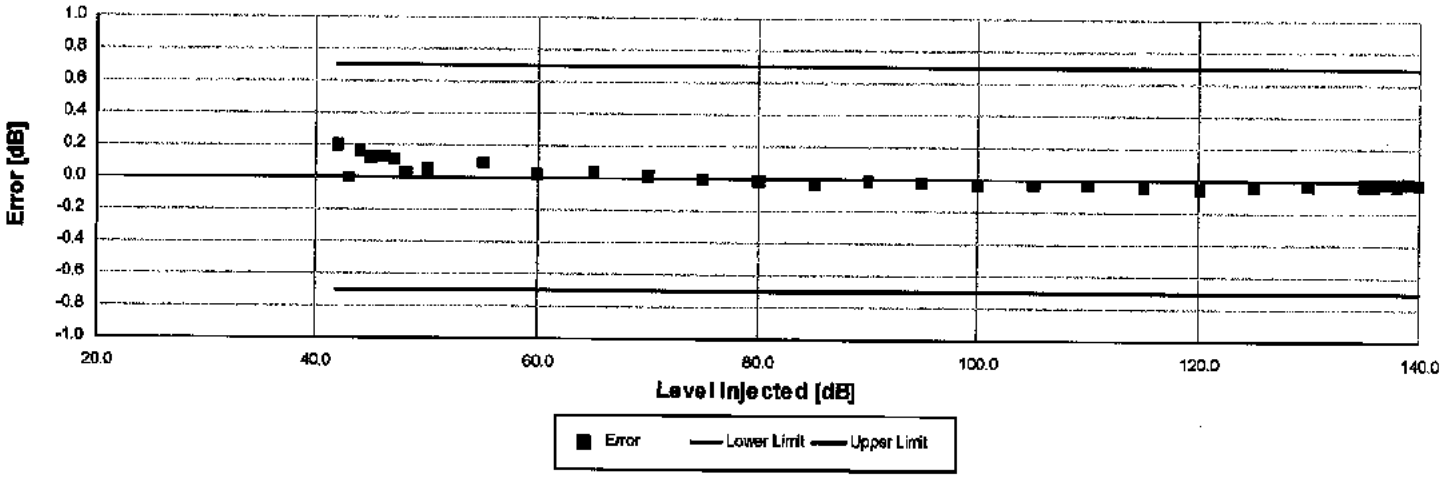


1/1 octave level linearity at normal range with 0 dB gain performed according to IEC 61260:2001 4.6, ANSI S.11 (R2009) 4.6

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
44.00	0.29	-0.70	0.70	0.09	Pass
45.00	0.13	-0.70	0.70	0.09	Pass
46.00	0.04	-0.70	0.70	0.09	Pass
47.00	0.24	-0.70	0.70	0.10	Pass
48.00	0.23	-0.70	0.70	0.10	Pass
49.00	0.11	-0.70	0.70	0.10	Pass
50.00	0.04	-0.70	0.70	0.09	Pass
51.00	0.07	-0.70	0.70	0.09	Pass
55.00	0.06	-0.70	0.70	0.09	Pass
60.00	0.06	-0.70	0.70	0.09	Pass
65.00	0.01	-0.70	0.70	0.09	Pass
70.00	0.00	-0.70	0.70	0.09	Pass
75.00	-0.02	-0.70	0.70	0.09	Pass
80.00	-0.01	-0.70	0.70	0.09	Pass
85.00	-0.02	-0.70	0.70	0.09	Pass
90.00	-0.02	-0.70	0.70	0.09	Pass
95.00	-0.01	-0.70	0.70	0.09	Pass
100.00	-0.02	-0.70	0.70	0.09	Pass
105.00	-0.03	-0.70	0.70	0.09	Pass
110.00	-0.03	-0.70	0.70	0.09	Pass
115.00	-0.03	-0.70	0.70	0.09	Pass
120.00	-0.05	-0.70	0.70	0.09	Pass
125.00	-0.04	-0.70	0.70	0.09	Pass
130.00	-0.04	-0.70	0.70	0.09	Pass
135.00	-0.03	-0.70	0.70	0.09	Pass
136.00	-0.03	-0.70	0.70	0.09	Pass
137.00	-0.02	-0.70	0.70	0.09	Pass
138.00	-0.02	-0.70	0.70	0.09	Pass
139.00	-0.03	-0.70	0.70	0.09	Pass
140.00	-0.02	-0.70	0.70	0.09	Pass

-- End of measurement results--

1/3 Octave Log Linearity: 1,000.00 Hz



1/3 octave level linearity at normal range with 0 dB gain performed according to IEC 61260:2001 4.6, ANSI S.11 (R2009) 4.6

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
42.00	0.20	-0.70	0.70	0.09	Pass
43.00	-0.01	-0.70	0.70	0.10	Pass
44.00	0.16	-0.70	0.70	0.10	Pass
45.00	0.12	-0.70	0.70	0.10	Pass
46.00	0.13	-0.70	0.70	0.09	Pass
47.00	0.11	-0.70	0.70	0.09	Pass
48.00	0.02	-0.70	0.70	0.09	Pass
50.00	0.05	-0.70	0.70	0.09	Pass
55.00	0.09	-0.70	0.70	0.09	Pass
60.00	0.02	-0.70	0.70	0.09	Pass
65.00	0.03	-0.70	0.70	0.09	Pass
70.00	0.01	-0.70	0.70	0.09	Pass
75.00	-0.01	-0.70	0.70	0.09	Pass
80.00	-0.02	-0.70	0.70	0.09	Pass
85.00	-0.03	-0.70	0.70	0.09	Pass
90.00	-0.02	-0.70	0.70	0.09	Pass
95.00	-0.02	-0.70	0.70	0.09	Pass
100.00	-0.03	-0.70	0.70	0.09	Pass
105.00	-0.04	-0.70	0.70	0.09	Pass
110.00	-0.03	-0.70	0.70	0.09	Pass
115.00	-0.04	-0.70	0.70	0.09	Pass
120.00	-0.05	-0.70	0.70	0.09	Pass
125.00	-0.04	-0.70	0.70	0.09	Pass
130.00	-0.04	-0.70	0.70	0.09	Pass
135.00	-0.03	-0.70	0.70	0.09	Pass
136.00	-0.02	-0.70	0.70	0.09	Pass
137.00	-0.02	-0.70	0.70	0.09	Pass
138.00	-0.02	-0.70	0.70	0.09	Pass
139.00	-0.02	-0.70	0.70	0.09	Pass
140.00	-0.02	-0.70	0.70	0.09	Pass

-- End of measurement results--

Slow Detector

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200	-7.56	-7.92	-6.92	0.09	Pass
	2	-27.16	-29.99	-25.99	0.09	Pass

-- End of measurement results--

Fast Detector

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200.00	-1.04	-1.48	-0.48	0.09	Pass
	2.00	-18.13	-19.49	-16.99	0.09	Pass
	0.25	-27.31	-29.99	-25.99	0.09	Pass

-- End of measurement results--

Sound Exposure Level

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200.00	-7.01	-7.49	-6.49	0.09	Pass
	2.00	-27.04	-28.49	-25.99	0.09	Pass
	0.25	-36.15	-39.02	-35.02	0.09	Pass

-- End of measurement results--

Peak C-weight

C-weighted peak sound level performed according to IEC 61672-3:2013 19 and ANSI S1.4-2014 Part 3: 19 for compliance to IEC 61672-1:2013 5.13 and ANSI S1.4-2014 Part 1: 5.13

Level [dB]	Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
135.00	31.50	138.22	135.50	139.50	0.09	Pass
135.00	500.00	138.56	137.50	139.50	0.09	Pass
135.00	8,000.00	137.76	136.40	140.40	0.10	Pass
135.00, Negative	500.00	137.15	136.40	138.40	0.09	Pass
135.00, Positive	500.00	137.15	136.40	138.40	0.09	Pass

-- End of measurement results--

Peak Z-weight

Z-weighted peak sound level performed according to IEC 60651:2001 9.4.4 and ANSI S1.4:1983 (R2006) 8.4.4

Amplitude [dB]	Duration [µs]		Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
136.00	100	Negative Pulse	136.34	134.01	138.01	0.09	Pass
	100	Positive Pulse	136.34	134.00	138.00	0.09	Pass
126.00	100	Negative Pulse	126.34	124.02	128.02	0.09	Pass
	100	Positive Pulse	126.35	124.00	128.00	0.09	Pass
116.00	100	Negative Pulse	116.38	114.05	118.05	0.09	Pass
	100	Positive Pulse	116.35	114.02	118.02	0.09	Pass
106.00	100	Negative Pulse	106.36	104.04	108.04	0.09	Pass
	100	Positive Pulse	106.38	104.02	108.02	0.09	Pass

-- End of measurement results--

Overload Detector

Overload indication performed according to IEC 61672-3:2013 20 and ANSI S1.4-2014 Part 3: 20 for compliance to IEC 61672-1:2013 5.11, IEC 60804:2000 9.3.5, IEC 61252:2002 11, ANSI S1.4 (R2006) 5.8, and ANSI S1.4-2014 Part 1: 5.11, ANSI S1.25 (R2007) 7.6, ANSI S1.43 (R2007) 7

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
Positive	141.00	140.00	142.00	0.09	Pass
Negative	140.90	140.00	142.00	0.09	Pass
Difference	0.10	-1.50	1.50	0.10	Pass

-- End of measurement results--

Peak Rise Time

Peak rise time performed according to IEC 60651:2001 9.4.4 and ANSI S1.4:1983 (R2006) 8.4.4

Amplitude [dB]	Duration [µs]		Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	40	Negative Pulse	136.53	135.04	137.04	0.09	Pass
		Positive Pulse	136.50	134.99	136.99	0.09	Pass
	30	Negative Pulse	135.61	135.04	137.04	0.09	Pass
		Positive Pulse	135.58	134.99	136.99	0.09	Pass

-- End of measurement results--

Positive Pulse Crest Factor

200 µs pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
138.00	3	OVLD	± 0.50	0.09	Pass
	5	OVLD	± 1.00	0.09	Pass
	10	OVLD	± 1.50	0.09	Pass
128.00	3	-0.08	± 0.50	0.10	Pass
	5	-0.07	± 1.00	0.09	Pass
	10	OVLD	± 1.50	0.09	Pass
118.00	3	-0.09	± 0.50	0.10	Pass
	5	-0.08	± 1.00	0.09	Pass
	10	-0.06	± 1.50	0.09	Pass
108.00	3	-0.08	± 0.50	0.13	Pass
	5	-0.10	± 1.00	0.09	Pass
	10	-0.13	± 1.50	0.09	Pass

-- End of measurement results--

Negative Pulse Crest Factor

200 µs pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
138.00	3	OVLD	± 0.50	0.09	Pass
	5	OVLD	± 1.00	0.09	Pass
	10	OVLD	± 1.50	0.09	Pass
128.00	3	-0.06	± 0.50	0.09	Pass
	5	-0.05	± 1.00	0.09	Pass
	10	OVLD	± 1.50	0.09	Pass
118.00	3	-0.08	± 0.50	0.09	Pass
	5	-0.07	± 1.00	0.09	Pass
	10	-0.04	± 1.50	0.09	Pass
108.00	3	-0.05	± 0.50	0.09	Pass
	5	-0.07	± 1.00	0.09	Pass
	10	-0.09	± 1.50	0.09	Pass

-- End of measurement results--

Tone Burst

2kHz tone burst tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

one burst response measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
138.00	3	OVLD	± 0.50	0.09	Pass
	5	OVLD	± 1.00	0.09	Pass
128.00	3	-0.07	± 0.50	0.12	Pass
	5	-0.03	± 1.00	0.09	Pass
118.00	3	-0.07	± 0.50	0.09	Pass
	5	0.01	± 1.00	0.09	Pass
108.00	3	-0.07	± 0.50	0.09	Pass
	5	-0.02	± 1.00	0.09	Pass

-- End of measurement results--

Impulse Detector - Repeat

Impulse Detector measured according to IEC 60651:2001 9.4.3 and ANSI S1.4:1983 (R2006) 8.4.3

Amplitude [dB]	Repitition Rate [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140	100.00	-2.76	-3.71	-1.71	0.09	Pass
	20.00	-7.72	-9.57	-5.57	0.09	Pass
	2.00	-8.72	-10.76	-6.76	0.09	Pass
Step	2.00	5.07	4.00	6.00	0.11	Pass

-- End of measurement results--

Impulse Detector - Single

Impulse Detector measured according to IEC 60651:2001 9.4.3 and ANSI S1.4:1983 (R2006) 8.4.3

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140	20.00	-3.67	-5.11	-2.11	0.09	Pass
	5.00	-8.79	-10.76	-6.76	0.10	Pass
	2.00	-12.83	-14.55	-10.55	0.11	Pass
Step	2.00	9.73	9.00	11.00	0.11	Pass

-- End of measurement results--

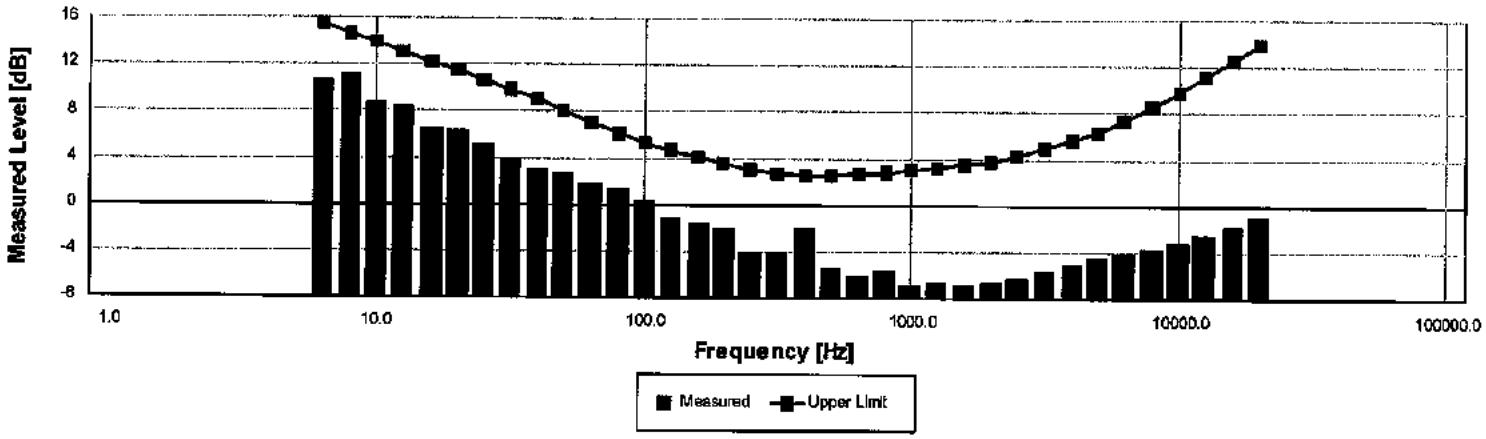
Gain

Gain measured according to IEC 61672-3:2013 17.3 and 17.4 and ANSI S1.4-2014 Part 3: 17.3 and 17.4

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
0 dB Gain	94.02	93.90	94.10	0.09	Pass
0 dB Gain, Linearity	28.92	28.30	29.70	0.10	Pass
20 dB Gain	94.01	93.90	94.10	0.09	Pass
20 dB Gain, Linearity	23.72	23.30	24.70	0.12	Pass
OBA Low Range	94.00	93.90	94.10	0.09	Pass
OBA Normal Range	94.00	93.20	94.80	0.09	Pass

-- End of measurement results--

1/3-Octave Self-Generated Noise



The SLM is set to low range and 20 dB gain.

Frequency [Hz]	Test Result [dB]	Upper limit [dB]	Result
6.30	10.73	15.50	Pass
8.00	11.25	14.70	Pass
10.00	8.72	13.90	Pass
12.50	8.40	13.10	Pass
16.00	6.51	12.30	Pass
20.00	6.37	11.50	Pass
25.00	5.13	10.70	Pass
31.50	3.88	9.90	Pass
40.00	3.01	9.10	Pass
50.00	2.67	8.10	Pass
63.00	1.85	7.10	Pass
80.00	1.27	6.10	Pass
100.00	0.33	5.30	Pass
125.00	-1.06	4.70	Pass
160.00	-1.60	4.10	Pass
200.00	-1.98	3.60	Pass
250.00	-3.95	3.10	Pass
315.00	-4.04	2.70	Pass
400.00	-1.95	2.60	Pass
500.00	-5.48	2.60	Pass
630.00	-6.12	2.70	Pass
800.00	-5.60	2.80	Pass
1,000.00	-6.74	3.00	Pass
1,250.00	-6.69	3.20	Pass
1,600.00	-6.80	3.50	Pass
2,000.00	-6.56	3.80	Pass
2,500.00	-6.20	4.30	Pass
3,150.00	-5.53	4.90	Pass
4,000.00	-4.99	5.70	Pass
5,000.00	-4.32	6.40	Pass
6,300.00	-4.00	7.40	Pass
8,000.00	-3.70	8.60	Pass
10,000.00	-3.20	9.80	Pass
12,500.00	-2.51	11.20	Pass
16,000.00	-1.72	12.60	Pass
20,000.00	-0.84	14.00	Pass

-- End of measurement results--

Broadband Noise Floor

Self-generated noise measured according to IEC 61672-3:2013 11.2 and ANSI S1.4-2014 Part 3: 11.2

Measurement	Test Result [dB]	Upper limit [dB]	Result
A-weight Noise Floor	6.98	15.00	Pass
C-weight Noise Floor	12.74	17.30	Pass
Z-weight Noise Floor	22.57	24.50	Pass

-- End of measurement results--

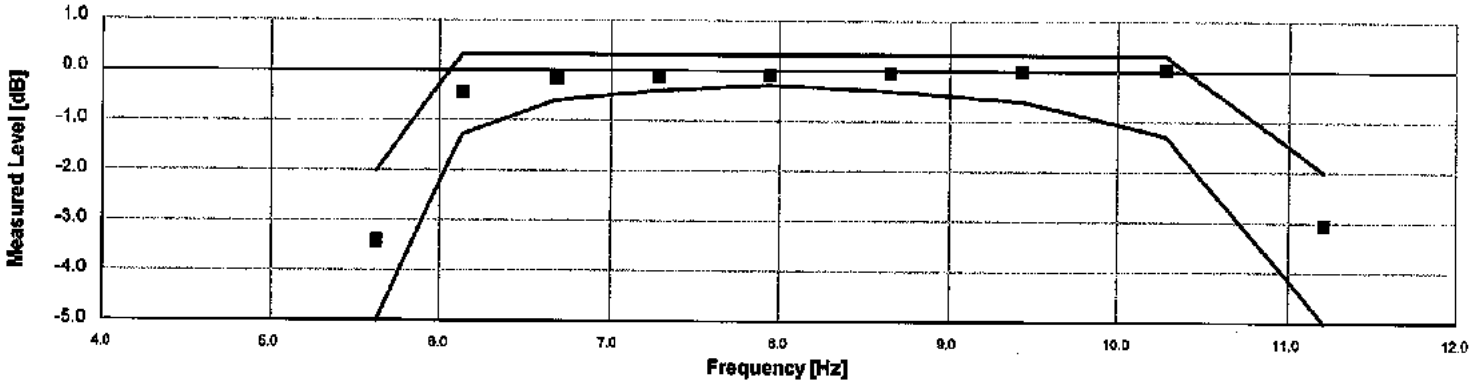
Total Harmonic Distortion

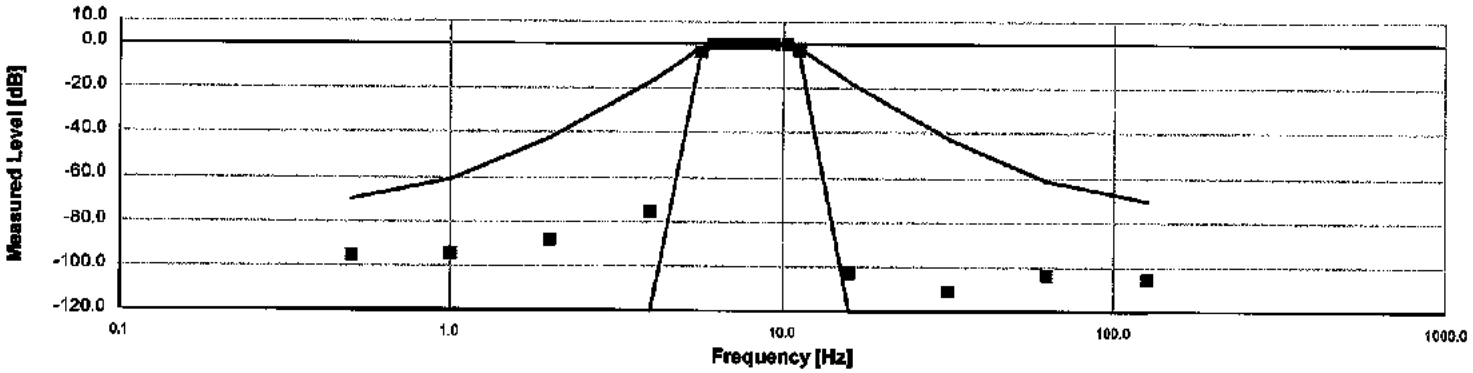
Measured using 1/3-Octave filters

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
10 Hz Signal	137.49	137.20	138.80	0.09	Pass
THD	-75.49		-60.00	0.01	Pass
THD+N	-67.21		-60.00	0.01	Pass

-- End of measurement results--

1/1 Octave Filter: 8.0 Hz



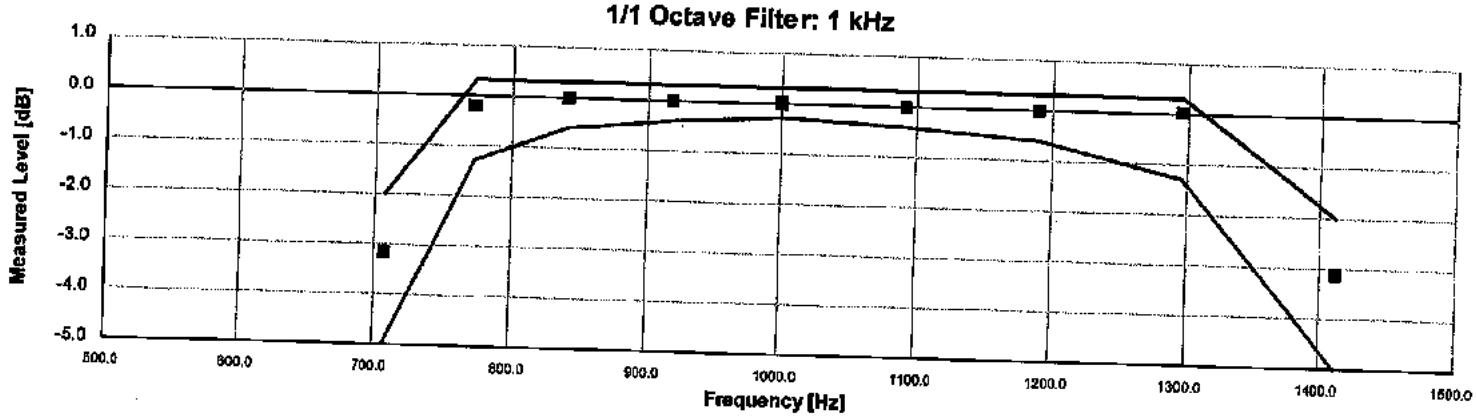


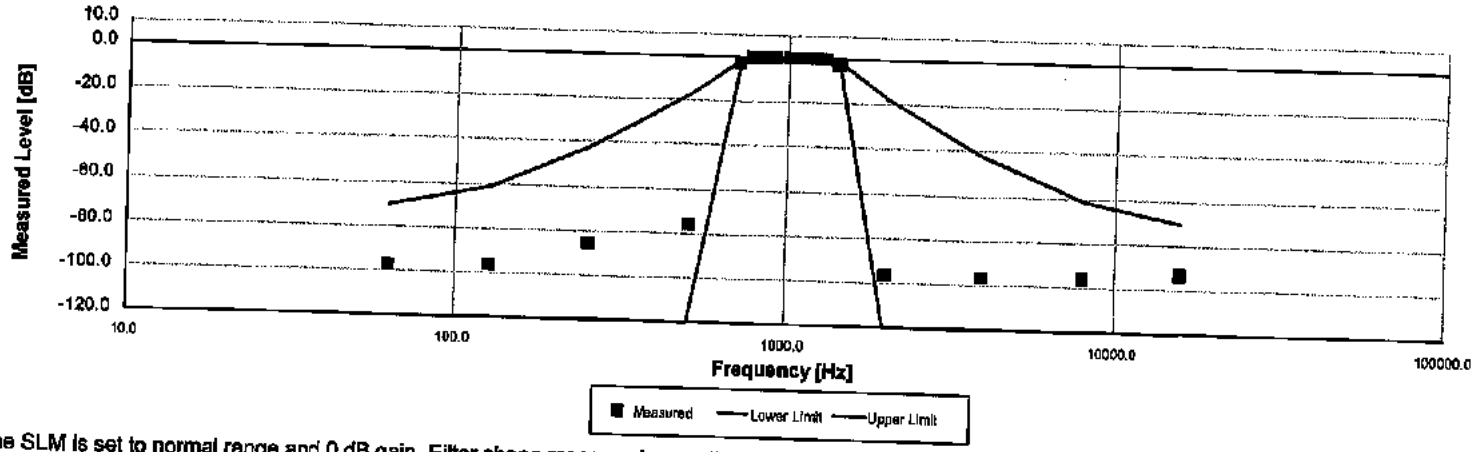
The SLM is set to normal range and 0 dB gain. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
0.50	-95.48	-inf	-70.00	2.40	Pass
1.00	-94.45	-inf	-61.00	2.20	Pass
2.00	-88.34	-inf	-42.00	0.24	Pass
3.98	-75.74	-inf	-17.50	0.23	Pass
5.62	-3.42	-5.00	-2.00	0.09	Pass
6.13	-0.44	-1.30	0.30	0.09	Pass
6.68	-0.18	-0.60	0.30	0.09	Pass
7.29	-0.14	-0.40	0.30	0.09	Pass
7.94	-0.10	-0.30	0.30	0.09	Pass
8.66	-0.07	-0.40	0.30	0.09	Pass
9.44	-0.02	-0.60	0.30	0.09	Pass
10.29	0.03	-1.30	0.30	0.09	Pass
11.22	-3.06	-5.00	-2.00	0.09	Pass
15.85	-102.44	-inf	-17.50	1.30	Pass
31.62	-110.49	-inf	-42.00	1.70	Pass
63.10	-103.48	-inf	-61.00	1.10	Pass
125.89	-105.57	-inf	-70.00	1.80	Pass

-- End of measurement results--

1/1 Octave Filter: 1 kHz



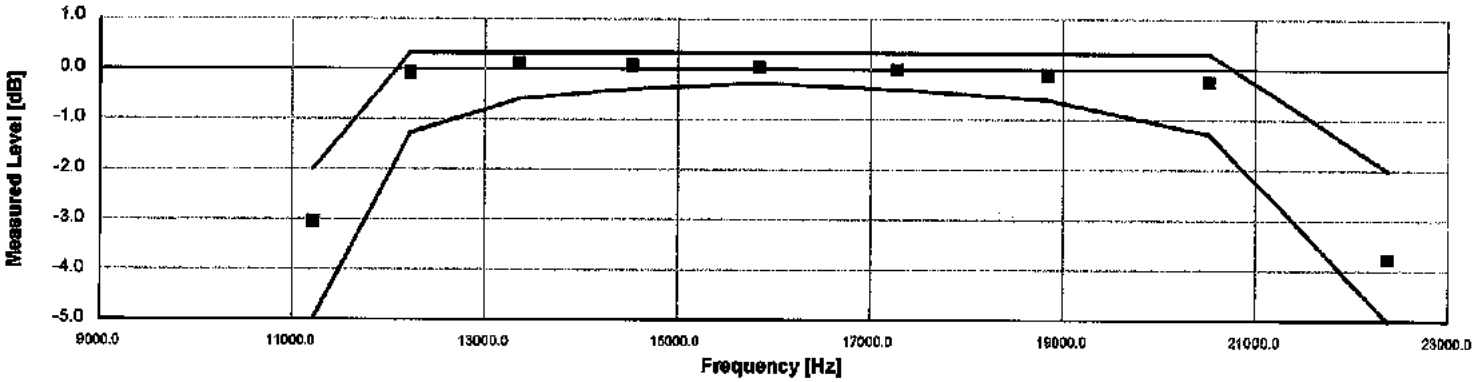


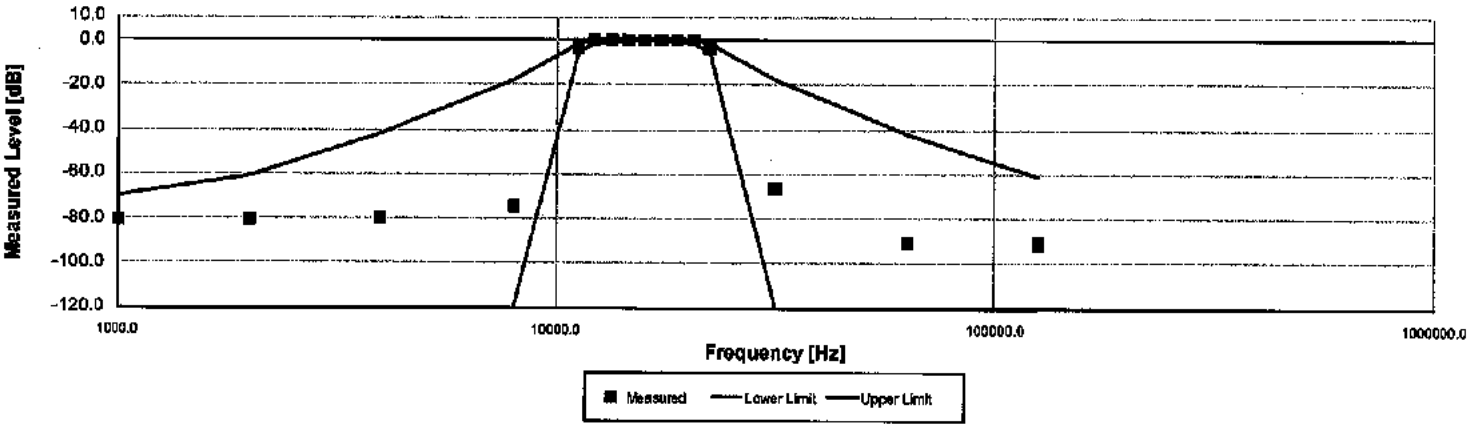
The SLM is set to normal range and 0 dB gain. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
63.10	-96.99	-inf	-70.00	0.28	Pass
125.89	-96.57	-inf	-61.00	0.32	Pass
251.19	-85.48	-inf	-42.00	0.18	Pass
501.19	-75.26	-inf	-17.50	0.09	Pass
707.95	-3.15	-5.00	-2.00	0.09	Pass
771.79	-0.22	-1.30	0.30	0.09	Pass
841.40	-0.02	-0.60	0.30	0.09	Pass
917.28	-0.01	-0.40	0.30	0.09	Pass
1,000.00	0.01	-0.30	0.30	0.09	Pass
1,090.18	-0.03	-0.40	0.30	0.09	Pass
1,188.50	-0.02	-0.60	0.30	0.09	Pass
1,295.69	0.01	-1.30	0.30	0.09	Pass
1,412.54	-3.13	-5.00	-2.00	0.09	Pass
1,995.26	-96.27	-inf	-17.50	0.26	Pass
3,981.07	-96.64	-inf	-42.00	0.26	Pass
7,943.28	-95.85	-inf	-61.00	0.31	Pass
15,848.93	-93.13	-inf	-70.00	0.24	Pass

-- End of measurement results--

1/1 Octave Filter: 16 kHz



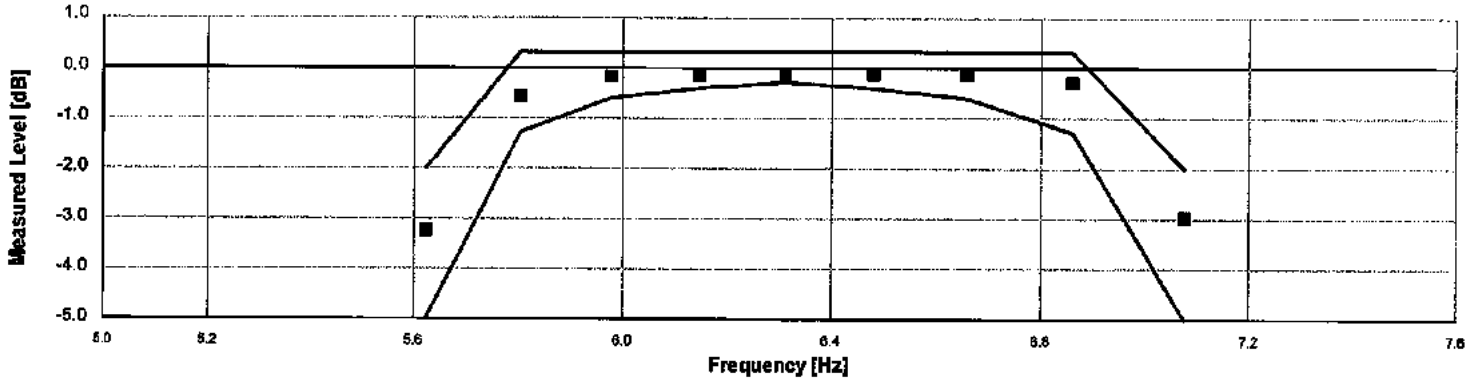


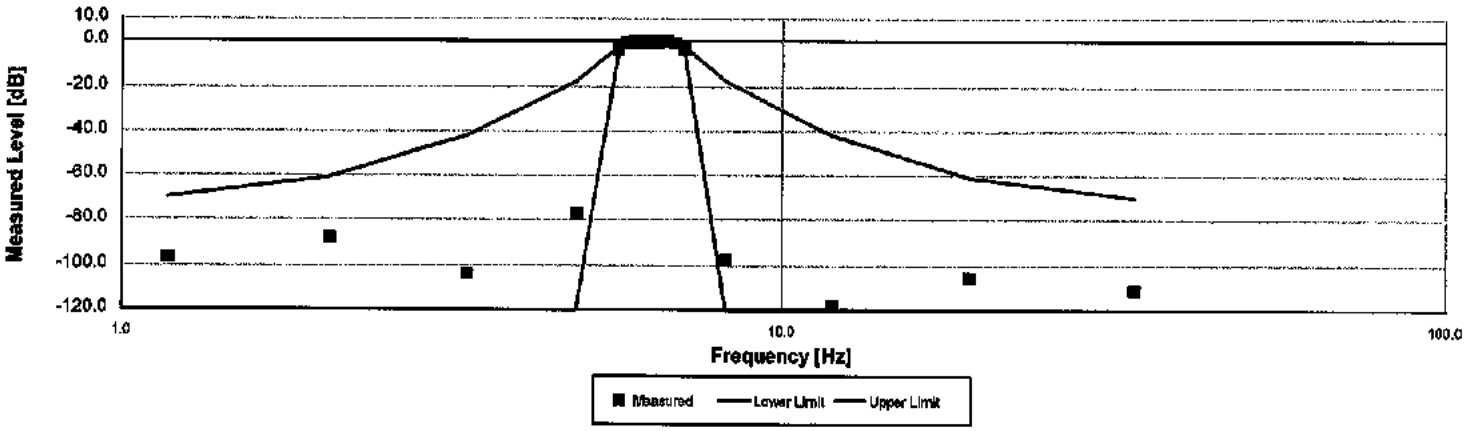
The SLM is set to normal range and 0 dB gain. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
1,000.00	-80.71	-inf	-70.00	0.11	Pass
1,995.26	-80.48	-inf	-61.00	0.09	Pass
3,981.07	-79.97	-inf	-42.00	0.10	Pass
7,943.28	-74.50	-inf	-17.50	0.10	Pass
11,220.18	-3.03	-5.00	-2.00	0.09	Pass
12,232.07	-0.11	-1.30	0.30	0.09	Pass
13,335.21	0.10	-0.60	0.30	0.09	Pass
14,537.84	0.07	-0.40	0.30	0.09	Pass
15,848.93	0.04	-0.30	0.30	0.09	Pass
17,278.26	-0.02	-0.40	0.30	0.09	Pass
18,836.49	-0.13	-0.60	0.30	0.09	Pass
20,535.25	-0.25	-1.30	0.30	0.09	Pass
22,387.21	-3.75	-5.00	-2.00	0.09	Pass
31,622.78	-66.77	-inf	-17.50	0.09	Pass
63,095.73	-91.04	-inf	-42.00	0.10	Pass
125,892.54	-91.20	-inf	-61.00	0.09	Pass

-- End of measurement results--

1/3 Octave Filter: 6.3 Hz



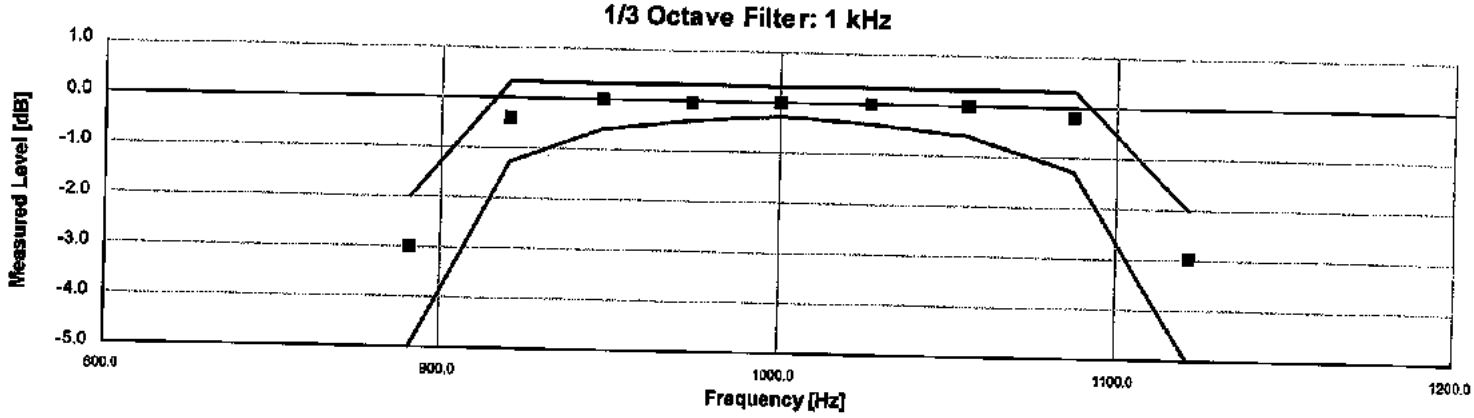


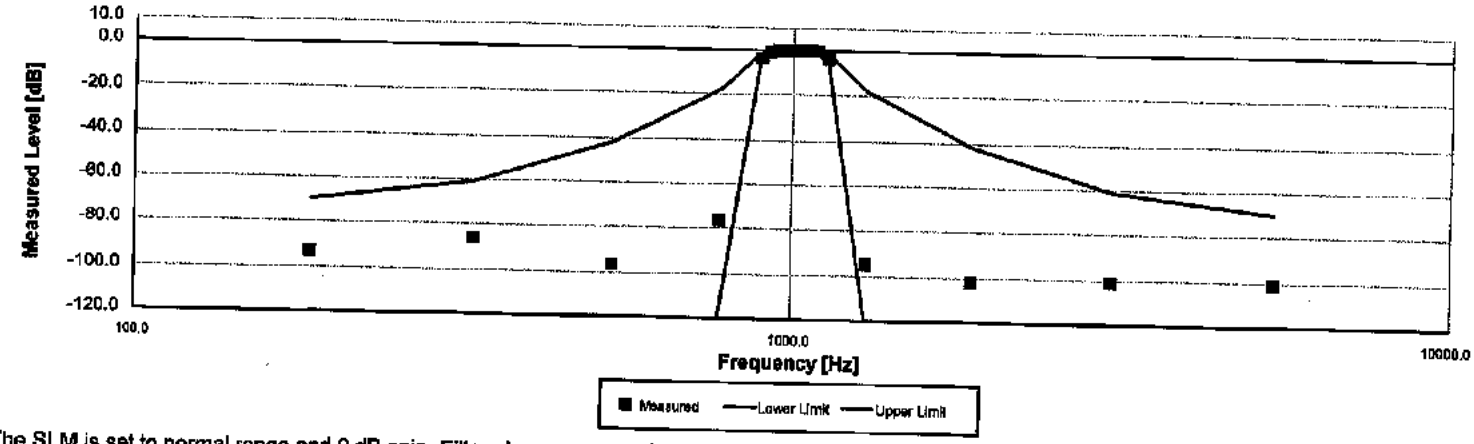
The SLM is set to normal range and 0 dB gain. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
1.17	-96.56	-inf	-70.00	0.36	Pass
2.07	-88.08	-inf	-61.00	0.11	Pass
3.35	-103.50	-inf	-42.00	0.09	Pass
4.87	-76.83	-inf	-17.50	0.10	Pass
5.62	-3.23	-5.00	-2.00	0.09	Pass
5.80	-0.58	-1.30	0.30	0.09	Pass
5.98	-0.16	-0.60	0.30	0.09	Pass
6.15	-0.16	-0.40	0.30	0.09	Pass
6.31	-0.14	-0.30	0.30	0.09	Pass
6.48	-0.13	-0.40	0.30	0.09	Pass
6.66	-0.12	-0.60	0.30	0.09	Pass
6.86	-0.30	-1.30	0.30	0.09	Pass
7.08	-2.95	-5.00	-2.00	0.09	Pass
8.17	-97.44	-inf	-17.50	0.34	Pass
11.87	-118.24	-inf	-42.00	1.70	Pass
19.27	-105.62	-inf	-61.00	2.50	Pass
34.02	-111.07	-inf	-70.00	2.10	Pass

-- End of measurement results--

1/3 Octave Filter: 1 kHz



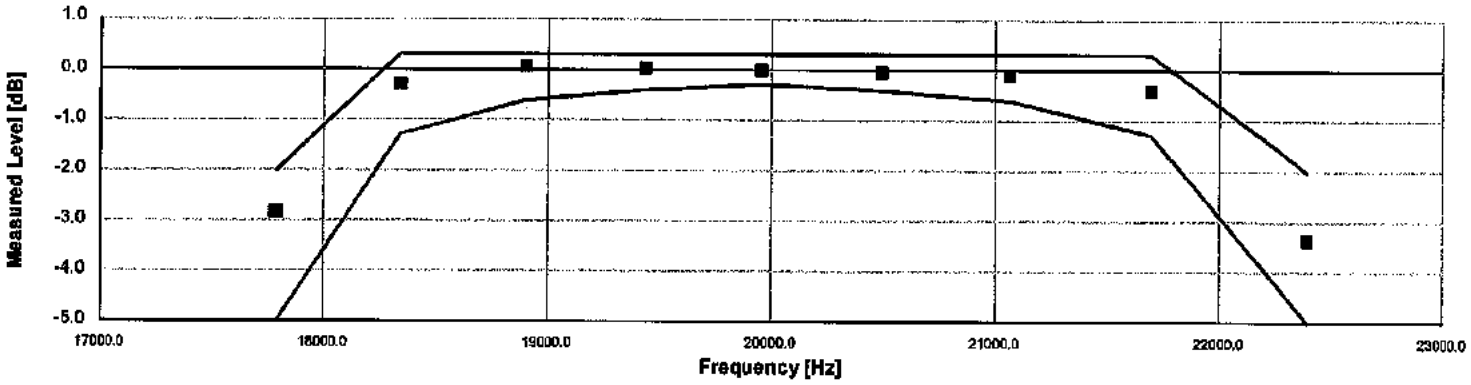


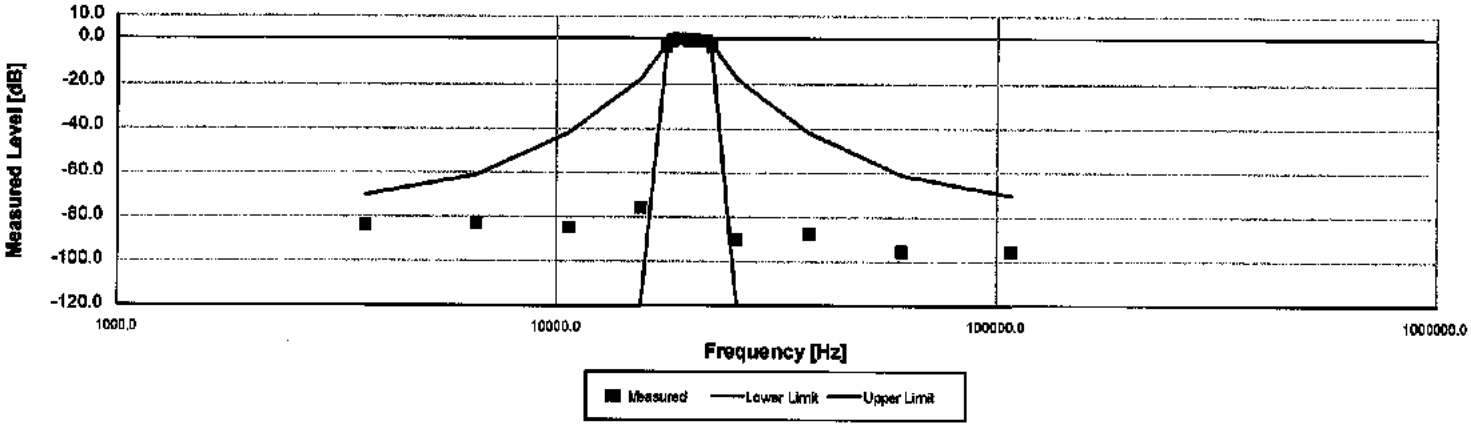
The SLM is set to normal range and 0 dB gain. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
185.46	-93.12	-inf	-70.00	0.17	Pass
327.48	-86.36	-inf	-61.00	0.12	Pass
531.43	-96.90	-inf	-42.00	0.25	Pass
772.57	-76.22	-inf	-17.50	0.09	Pass
891.25	-3.00	-5.00	-2.00	0.09	Pass
919.58	-0.41	-1.30	0.30	0.09	Pass
947.19	0.00	-0.60	0.30	0.09	Pass
974.02	-0.04	-0.40	0.30	0.09	Pass
1,000.00	0.00	-0.30	0.30	0.09	Pass
1,026.67	0.00	-0.40	0.30	0.09	Pass
1,055.75	-0.01	-0.60	0.30	0.09	Pass
1,087.46	-0.23	-1.30	0.30	0.09	Pass
1,122.02	-2.96	-5.00	-2.00	0.09	Pass
1,294.37	-95.38	-inf	-17.50	0.25	Pass
1,881.73	-102.20	-inf	-42.00	0.40	Pass
3,053.65	-101.67	-inf	-61.00	0.44	Pass
5,391.95	-101.21	-inf	-70.00	0.40	Pass

-- End of measurement results--

1/3 Octave Filter: 20 kHz





The SLM is set to normal range and 0 dB gain. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
3,700.45	-83.56	-inf	-70.00	0.11	Pass
6,534.02	-82.94	-inf	-61.00	0.11	Pass
10,603.35	-84.18	-inf	-42.00	0.13	Pass
15,414.88	-75.67	-inf	-17.50	0.09	Pass
17,782.79	-2.83	-5.00	-2.00	0.09	Pass
18,347.97	-0.30	-1.30	0.30	0.09	Pass
18,898.93	0.08	-0.60	0.30	0.09	Pass
19,434.23	0.02	-0.40	0.30	0.09	Pass
19,952.62	-0.03	-0.30	0.30	0.09	Pass
20,484.85	-0.05	-0.40	0.30	0.09	Pass
21,065.07	-0.11	-0.60	0.30	0.09	Pass
21,697.62	-0.41	-1.30	0.30	0.09	Pass
22,387.21	-3.36	-5.00	-2.00	0.09	Pass
25,826.16	-89.68	-inf	-17.50	0.12	Pass
37,545.40	-87.51	-inf	-42.00	0.11	Pass
60,928.37	-94.94	-inf	-61.00	0.12	Pass
107,583.52	-94.89	-inf	-70.00	0.11	Pass

-- End of measurement results--

-- End of Report--

Signatory: Ron Harris

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED
Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.41004

Instrument: **Microphone**
Model: **377B20**
Manufacturer: **PCB Piezotronics**
Serial number: **112245**
Composed of:

Date Calibrated: **7/5/2018** *Cal Due:* **7/5/2019**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No

Customer: **Epsilon Associates, Inc.**
Tel/Fax: **978-897-7100/**
Address: **3 Mill & Main Place, Suite 250, Maynard, MA 01754**

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 2/25/2015

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 30, 2017	Scantek, Inc./ NVLAP	Oct 30, 2018
DS-360-SRS	Function Generator	33584	Oct 24, 2017	ACR Env./ A2LA	Oct 24, 2019
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Oct 25, 2017	ACR Env. / A2LA	Oct 25, 2018
HM30-Thommen	Meteo Station	1040170/39633	Oct 25, 2017	ACR Env./ A2LA	Oct 25, 2018
PC Program 1017 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Nov 10, 2017	Scantek, Inc./ NVLAP	Nov 10, 2018
1203-Norsonic	Preamplifier	14059	Feb 12, 2018	Scantek, Inc./ NVLAP	Feb 12, 2019
4180-Brüel&Kjær	Microphone	2246115	Oct 24, 2017	DANAK / DPLA	Oct 24, 2019

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Lydon Dawkins	Authorized signatory:	Steven E. Marshall
Signature	Lydon Dawkins	Signature	Steven E Marshall
Date	7/5/2018	Date	7/6/2018

Results summary: Device was tested and complies with following clauses of mentioned specifications:

CLAUSES / METHODS[1] FROM PROCEDURES		MET[2,3]	NOT MET	NOT TESTED	MEASUREMENT EXPANDED UNCERTAINTY (coverage factor 2)
Open circuit sensitivity (insert voltage method, 250 Hz)		X			See below
Frequency response	Actuator response	X			63 – 200Hz: 0.3 dB 200 – 8000 Hz: 0.2 dB 8 – 10 kHz: 0.5 dB 10 – 20 kHz: 0.7 dB 20 – 50 kHz: 0.9 dB 50 – 100 kHz: 1.2 dB
	FF/Diffuse field responses	X			63 – 200Hz: 0.3 dB 200 – 4000 Hz: 0.2 dB 4 – 10 kHz: 0.6 dB 10 – 20 kHz: 0.9 dB 20 – 50 kHz: 2.2 dB 50 – 100 kHz: 4.4 dB
	Scantek, Inc. acoustical method			X	31.5 – 125 Hz: 0.16 dB 250, 1000 Hz: 0.12 dB 2 – 8 kHz: 0.8 dB 12.5 – 16 kHz: 2.4 dB

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.

[2] Results are normalized to the reference conditions.

[3] The tests marked with (*) are not covered by the current NVLAP accreditation.

Note: The free field/diffuse field characteristics were calculated based on the measured actuator response and adjustment coefficients as provided by the manufacturer. The uncertainties reported for these characteristics may include assumed uncertainty components for the adjustment coefficients.

Comments: The instrument was tested and met all specifications found in the referenced procedures.

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
22.3 ± 1.0	100.99 ± 0.020	55.0 ± 2.4

Main measured parameters:

Tone frequency (Hz)	Measured[4] /Acceptable Open circuit sensitivity (dB re 1V/Pa)	Sensitivity (mV/Pa)
250	-25.15 ± 0.12/ -26.0 ±1.5	55.27

[4] The reported expanded uncertainty is calculated with a coverage factor k=2.00

Tests made with following attachments to instrument and auxiliary devices:

Protection grid mounted for sensitivity measurements
Actuator type: G.R.A.S. RA0014

Measured Data: Found on Microphone Test Report # 41004 of one page.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA
Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.41003

Instrument: **Sound Level Meter**
Model: **831**
Manufacturer: **Larson Davis**
Serial number: **0002154**
Tested with: **Microphone 377B20 s/n 112245**
Preamplifier PRM831 s/n 016477
Type (class): **1**
Customer: **Epsilon Associates, Inc.**
Tel/Fax: **978-897-7100 /**

Date Calibrated: **7/5/2018** *Cal Due:* **7/5/2019**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: ___Yes _X_ No
Calibration service: ___ Basic _X_ Standard
Address: **3 Mill & Main Place, Suite 250, Maynard, MA 01754**

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence	Cal. Due
				Cal. Lab / Accreditation	
4838-Norsonic	SME Cal Unit	31052	Oct 30, 2017	Scantek, Inc./ NVLAP	Oct 30, 2018
DS-360-SRS	Function Generator	33584	Oct 24, 2017	ACR Env./ A2LA	Oct 24, 2019
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Oct 25, 2017	ACR Env. / A2LA	Oct 25, 2018
HM30-Thommen	Meteo Station	1040170/39633	Oct 25, 2017	ACR Env./ A2LA	Oct 25, 2018
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 10, 2017	Scantek, Inc./ NVLAP	Nov 10, 2018

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
21.4	100.75	52.4

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Steven E. Marshall
Signature	Lydon Dawkins	Signature	Steven E. Marshall
Date	7/5/2018	Date	7/6/2018

Results summary: Device complies with following clauses of mentioned specifications:

CLAUSES [1] FROM IEC/ANSI STANDARDS REFERENCED IN PROCEDURES:	RESULT [2,3]	EXPANDED UNCERTAINTY (coverage factor 2) (dB)
INDICATION AT THE CALIBRATION CHECK FREQUENCY - IEC61672-3 ED.2 CLAUSE 10	Passed	0.15
SELF-GENERATED NOISE - IEC 61672-3 ED.2 CLAUSE 11	Passed	0.30
FREQUENCY WEIGHTINGS: A NETWORK - IEC 61672-3 ED.2.0 CLAUSE 13	Passed	0.20
FREQUENCY WEIGHTINGS: C NETWORK - IEC 61672-3 ED.2.0 CLAUSE 13	Passed	0.20
FREQUENCY WEIGHTINGS: Z NETWORK - IEC 61672-3 ED.2.0 CLAUSE 13	Passed	0.20
FREQUENCY AND TIME WEIGHTINGS AT 1 KHZ IEC 61672-3 ED.2.0 CLAUSE 14	Passed	0.20
LEVEL LINEARITY ON THE REFERENCE LEVEL RANGE - IEC 61672-3 ED.2 CLAUSE 16	Passed	0.25
LEVEL LINEARITY INCLUDING THE LEVEL RANGE CONTROL - IEC 61672-3 ED.2.0 CLAUSE 17	Passed	0.25
TONEBURST RESPONSE - IEC 61672-3 ED.2.0 CLAUSE 18	Passed	0.30
PEAK C SOUND LEVEL - IEC 61672-3 ED.2.0 CLAUSE 19	Passed	0.35
OVERLOAD INDICATION - IEC 61672-3 ED.2.0 CLAUSE 20	Passed	0.25
HIGH LEVEL STABILITY TEST - IEC 61672-3 ED.2.0 CLAUSE 21	Passed	0.10
LONG TERM STABILITY TEST - IEC 61672-3 ED.2.0 CLAUSE 15	Passed	0.10
FILTER TEST 1/1OCTAVE: RELATIVE ATTENUATION - IEC 61260, CLAUSE 4.4 & #5.3	Passed	0.25
FILTER TEST 1/3OCTAVE: RELATIVE ATTENUATION - IEC 61260, CLAUSE 4.4 & #5.3	Passed	0.25
COMBINED ELECTRICAL AND ACOUSTICAL TEST - IEC 61672-3 ED.2.0 CLAUSE 13	Passed	See test report

1 The results of this calibration apply only to the instrument type with serial number identified in this report.

2 Parameters are certified at actual environmental conditions.

3 The tests marked with (*) are not covered by the current NVLAP accreditation.

Comments: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2, to demonstrate that the model of sound level meter fully conforms to the requirements in the IEC 61672-2, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1.

Note: The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

Tests made with the following attachments to the instrument:

Microphone: PCB Piezotronics 377B20 s/n 112245 for acoustical test
Preamplifier: Larson Davis PRM831 s/n 016477 for all tests
Other: line adaptor ADP005 (18pF) for electrical tests
Accompanying acoustical calibrator: Larson Davis CAL200 s/n 7146
Windscreen: none

Measured Data: In Test Report # 41003 of 9 + 1 pages.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA

Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.39496

Instrument: **Microphone**
Model: **377B20**
Manufacturer: **PCB Piezotronics**
Serial number: **LW130579**
Composed of:

Date Calibrated: **10/19/2017** *Cal Due:* **10/19/2018**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No

Customer: **Epsilon Associates, Inc.**
Tel/Fax: **978-897-7100/**
Address: **3 Mill & Main Place, Suite 250, Maynard, MA 01754**

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 2/25/2015

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence	Cal. Due
				Cal. Lab / Accreditation	
483B-Norsonic	SME Cal Unit	31052	Oct 26, 2016	Scantek, Inc./ NVLAP	Oct 26, 2017
DS-360-SRS	Function Generator	33584	Oct 20, 2015	ACR Env./ A2LA	Oct 20, 2017
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Sep 9, 2017	ACR Env. / A2LA	Sep 9, 2018
HM30-Thommen	Meteo Station	1040170/39633	Nov 1, 2016	ACR Env./ A2LA	Nov 1, 2017
PC Program 1017 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Nov 10, 2016	Scantek, Inc./ NVLAP	Nov 10, 2017
1203-Norsonic	Preamplifier	14059	Feb 13, 2017	Scantek, Inc./ NVLAP	Feb 13, 2018
4180-Brüel&Kjær	Microphone	2246115	Oct 26, 2015	NPL-UK / UKAS	Oct 26, 2017

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	William D. Gallagher
Signature	Lydon Dawkins	Signature	William D. Gallagher
Date	10/19/2017	Date	10/24/2017

Results summary: Device was tested and complies with following clauses of mentioned specifications:

CLAUSES / METHODS[1] FROM PROCEDURES		MET[2,3]	NOT MET	NOT TESTED	MEASUREMENT EXPANDED UNCERTAINTY (coverage factor 2)
Open circuit sensitivity (Insert voltage method, 250 Hz)		X			See below
Frequency response	Actuator response	X			63 – 200Hz: 0.3 dB 200 – 8000 Hz: 0.2 dB 8 – 10 kHz: 0.5 dB 10 – 20 kHz: 0.7 dB 20 – 50 kHz: 0.9 dB 50 – 100 kHz: 1.2 dB
	FF/Diffuse field responses	X			63 – 200Hz: 0.3 dB 200 – 4000 Hz: 0.2 dB 4 – 10 kHz: 0.6 dB 10 – 20 kHz: 0.9 dB 20 – 50 kHz: 2.2 dB 50 – 100 kHz: 4.4 dB
	Scantek, Inc. acoustical method			X	31.5 – 125 Hz: 0.16 dB 250, 1000 Hz: 0.12 dB 2 – 8 kHz: 0.8 dB 12.5 – 16 kHz: 2.4 dB

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.

[2] Results are normalized to the reference conditions.

[3] The tests marked with (*) are not covered by the current NVLAP accreditation.

Note: The free field/diffuse field characteristics were calculated based on the measured actuator response and adjustment coefficients as provided by the manufacturer. The uncertainties reported for these characteristics may include assumed uncertainty components for the adjustment coefficients.

Comments: The instrument was tested and met all specifications found in the referenced procedures.

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.2 ± 1.0	100.75 ± 0.020	43.5 ± 2.2

Main measured parameters:

Tone frequency (Hz)	Measured[4] /Acceptable Open circuit sensitivity (dB re 1V/Pa)	Sensitivity (mV/Pa)
250	-26.87 ± 0.12/ -26.0 ±1.5	45.36

[4] The reported expanded uncertainty is calculated with a coverage factor k=2.00

Tests made with following attachments to instrument and auxiliary devices:

Protection grid mounted for sensitivity measurements
Actuator type: G.R.A.S. RA0014

Measured Data: Found on Microphone Test Report # 39496 of one page.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA

Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.39495

Instrument:	**Sound Level Meter**
Model:	**831**
Manufacturer:	**Larson Davis**
Serial number:	**0003047**
Tested with:	**Microphone 377B20 s/n LW130579** **Preamplifier PRM831 s/n 023825**
Type (class):	**1**
Customer:	**Epsilon Associates, Inc.**
Tel/Fax:	**978-897-7100 /**

Date Calibrated: **10/23/2017** *Cal Due:* **10/23/2018**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes X No
Calibration service: __ Basic X Standard
Address: **3 Mill & Main Place, Suite 250, Maynard, MA 01754**

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence	Cal. Due
				Cal. Lab / Accreditation	
4838-Norsonic	SME Cal Unit	31052	Oct 26, 2016	Scantek, Inc./ NVLAP	Oct 26, 2017
DS-360-SRS	Function Generator	61646	Sep 20, 2017	ACR Env. / A2LA	Sep 20, 2018
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Sep 9, 2017	ACR Env. / A2LA	Sep 9, 2018
HM30-Thommen	Meteo Station	1040170/39633	Nov 1, 2016	ACR Env./ A2LA	Nov 1, 2017
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 10, 2016	Scantek, Inc./ NVLAP	Nov 10, 2017

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
22.9	101.01	50.8

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	William D. Gallagher
Signature	Lydon Dawkins	Signature	William D Gallagher
Date	10/25/2017	Date	10/27/2017

Results summary: Device complies with following clauses of mentioned specifications:

CLAUSES[1] FROM IEC/ANSI STANDARDS REFERENCED IN PROCEDURES:	RESULT[2,3]	EXPANDED UNCERTAINTY (coverage factor 2) [dB]
INDICATION AT THE CALIBRATION CHECK FREQUENCY - IEC61672-3 ED.2 CLAUSE 10	Passed	0.15
SELF-GENERATED NOISE - IEC 61672-3 ED.2 CLAUSE 11	Passed	0.30
FREQUENCY WEIGHTINGS: A NETWORK - IEC 61672-3 ED.2.0 CLAUSE 13	Passed	0.20
FREQUENCY WEIGHTINGS: C NETWORK - IEC 61672-3 ED.2.0 CLAUSE 13	Passed	0.20
FREQUENCY WEIGHTINGS: Z NETWORK - IEC 61672-3 ED.2.0 CLAUSE 13	Passed	0.20
FREQUENCY AND TIME WEIGHTINGS AT 1 KHZ IEC 61672-3 ED.2.0 CLAUSE 14	Passed	0.20
LEVEL LINEARITY ON THE REFERENCE LEVEL RANGE - IEC 61672-3 ED.2 CLAUSE 16	Passed	0.25
LEVEL LINEARITY INCLUDING THE LEVEL RANGE CONTROL - IEC 61672-3 ED.2.0 CLAUSE 17	Passed	0.25
TONEBURST RESPONSE - IEC 61672-3 ED.2.0 CLAUSE 18	Passed	0.30
PEAK C SOUND LEVEL - IEC 61672-3 ED.2.0 CLAUSE 19	Passed	0.35
OVERLOAD INDICATION - IEC 61672-3 ED.2.0 CLAUSE 20	Passed	0.25
HIGH LEVEL STABILITY TEST - IEC 61672-3 ED.2.0 CLAUSE 21	Passed	0.10
LONG TERM STABILITY TEST - IEC 61672-3 ED.2.0 CLAUSE 15	Passed	0.10
FILTER TEST 1/1OCTAVE: RELATIVE ATTENUATION - IEC 61260, CLAUSE 4.4 & #5.3	Passed	0.25
FILTER TEST 1/3OCTAVE: RELATIVE ATTENUATION - IEC 61260, CLAUSE 4.4 & #5.3	Passed	0.25
COMBINED ELECTRICAL AND ACOUSTICAL TEST - IEC 61672-3 ED.2.0 CLAUSE 13	Passed	See test report

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.

[2] Parameters are certified at actual environmental conditions.

[3] The tests marked with (*) are not covered by the current NVLAP accreditation.

Comments: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2, to demonstrate that the model of sound level meter fully conforms to the requirements in the IEC 61672-2, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1.

Note: The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

Tests made with the following attachments to the instrument:

Microphone:	PCB Piezotronics 377B20 s/n LW130579 for acoustical test
Preamplifier:	Larson Davis PRM831 s/n 023825 for all tests
Other: line adaptor ADP005 (18pF) for electrical tests	
Accompanying acoustical calibrator:	Larson Davis CAL200 s/n 7147
Windscreen:	none

Measured Data: In Test Report # 39495 of 9 + 1 pages.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA
Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Certificate of Calibration and Conformance

This document certifies that the instrument referenced below meets published specifications per Procedure PRD-P263; ANSI S1.4-1983 (R 2006) Type 1; S1.4A-1985; S1.43-1997 Type 1; S1.11-2004 Octave Band Class 0; S1.25-1991; IEC 61672-2002 Class 1; 60651-2001 Type 1; 60804-2000 Type 1; 61260-2001 Class 0; 61252-2002.

Manufacturer:	Larson Davis	Temperature:	78.2	°F
Model Number:	831		25.67	°C
Serial Number:	2544	Rel. Humidity:	20.3	%
Customer:	TMS Rental	Pressure:	1004.9	mbars
Description:	Sound Level Meter		1004.9	hPa
Note:	As Found/As Left: In Tolerance			

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 3/23/2018 Calibration Due:

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	4/25/2018

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of The Modal Shop.

Technician: Adam Magee Signature:

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(800) 860-4867
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A PCB GROUP CO.

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www.modalshop.com

~Certificate of Calibration~

Manufacturer: PCB
Model Number: 377B20
Serial Number: 125687
Asset ID: 44387
Description: Random Microphone

Customer: TMS Rental
Address:

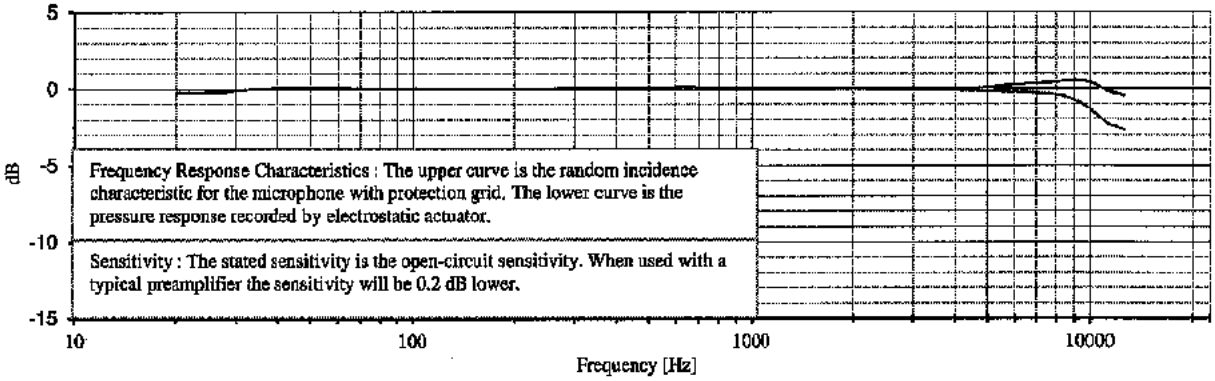
Calibration Date: Feb 20, 2018 16:03:28
Due Date:

Sensitivity:	**250 Hz**	**1 kHz**	
	-25.72	-25.73	dB re. 1V/Pa
	51.77	51.68	mV/Pa

Temperature:	80 (27)	°F (°C)
Humidity:	43	%
Ambient Pressure:	997.4	mbar

Cal. Results: In Tolerance

Polarization Voltage: 0 VDC



Traceability: The calibration is traceable through 6/3/284413-14.

Notes: Calibration results relate only to the items calibrated.
This certificate may not be reproduced, except in full, without written permission.
This calibration is performed in compliance with ISO 9001, ISO 17025 and ANSI Z540.
Measurement uncertainty (250 Hz sensitivity calibration) at 95% confidence level: 0.25 dB
Calibrated per procedure PRD-P204.

User Note: As Found / As Left: In Tolerance

Frequency Response with reference to level at 250 Hz

Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)
20	-0.24	630	0.13	4500	0.05		
25	-0.21	800	0.06	5000	0.10		
31.5	-0.05	1000	0.01	5600	0.20		
40	0.07	1120	-0.01	6300	0.30		
50	0.11	1250	0.02	7100	0.35		
63	0.05	1400	0.03	8000	0.46		
80	0.01	1600	0.01	9000	0.55		
100	0.01	1800	0.04	10000	0.42		
125	0.01	2000	0.06	11200	-0.13		
160	0.01	2240	0.02	12500	-0.44		
200	0.01	2500	-0.04				
250	0.00	2800	-0.03				
315	0.06	3150	0.04				
400	0.06	3550	0.06				
500	0.02	4000	0.03				

Technician: Bradly Haarmeyer

Approval: Bradly Haarmeyer

Reference Equipment Used:

Manuf.	*Model*	*Serial*	*Cal. Date*	*Due Date*
GRAS	40AG	58094	9/6/2017	9/6/2018

ACCREDITED
Calibration Lab
CALIBRATION CERT 2649.01

Certificate of Calibration and Conformance

This document certifies that the instrument referenced below meets published specifications per Procedure PRD-P263; ANSI S1.4-1983 (R 2006) Type 1; S1.4A-1985; S1.43-1997 Type 1; S1.11-2004 Octave Band Class 0; S1.25-1991; IEC 61672-2002 Class 1; 60651-2001 Type 1; 60804-2000 Type 1; 61260-2001 Class 0; 61252-2002.

Manufacturer:	Larson Davis	Temperature:	72.1	°F
Model Number:	831		22.28	°C
Serial Number:	3307	Rel. Humidity:	41.8	%
Customer:	TMS Rental	Pressure:	1000.2	mbars
Description:	Sound Level Meter		1000.2	hPa
Note:	As Found/As Left: In Tolerance			

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 2/16/2018 Calibration Due:

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	4/25/2018

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of The Modal Shop.

Technician: Adam Magee Signature:

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~Certificate of Calibration~

Manufacturer: PCB
Model Number: 377B20
Serial Number: LW134176
Asset ID:
Description: Random Microphone

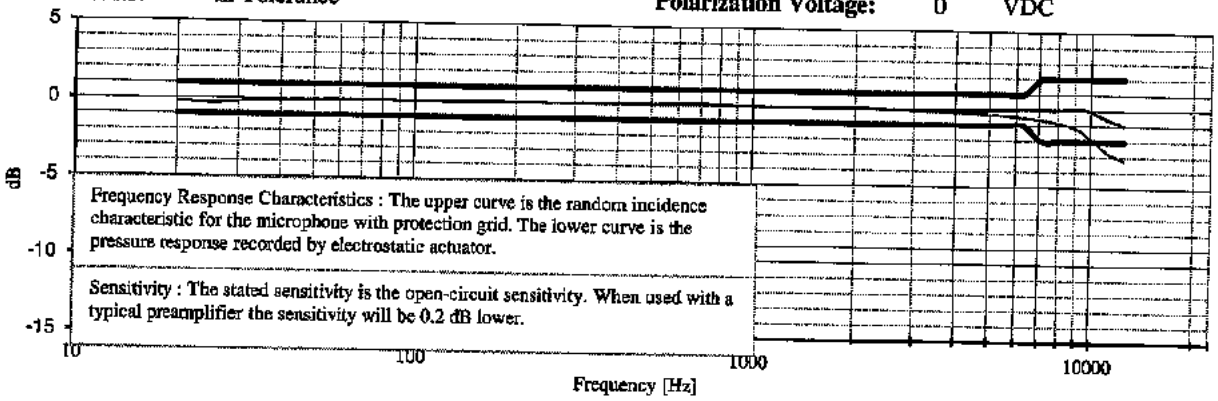
Customer: TMS Rental
Address:

Calibration Date: Mar 23, 2018 10:44:28
Due Date:

Sensitivity:	**250 Hz**	**1 kHz**	
	-26.07	-26.09	dB re. 1V/Pa
	49.74	49.62	mV/Pa

Temperature:	73 (23)	°F (°C)
Humidity:	26	%
Ambient Pressure:	1005	mbar
Polarization Voltage:	0	VDC

Cal. Results: In Tolerance



Traceability: The calibration is traceable through NIST Project A1633.
Notes: Calibration results relate only to the items calibrated.
This certificate may not be reproduced, except in full, without written permission.
This calibration is performed in compliance with ISO 9001, ISO 17025 and ANSI Z540.
Measurement uncertainty (250 Hz sensitivity calibration) at 95% confidence level: 0.30 dB
Calibrated per procedure PRD-P204.

User Note: As Found / As Left: In Tolerance.

Frequency Response with reference to level at 250 Hz

Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)
20	-0.17	630	0.13	4500	-0.09		
25	-0.27	800	0.06	5000	-0.07		
31.5	-0.14	1000	0.00	5600	-0.02		
40	-0.07	1120	-0.01	6300	0.03		
50	-0.03	1250	0.02	7100	0.01		
63	0.02	1400	0.03	8000	0.02		
80	0.00	1600	0.01	9000	0.14		
100	0.00	1800	0.02	10000	-0.05		
125	0.00	2000	0.04	11200	-0.57		
160	0.00	2240	-0.01	12500	-0.97		
200	0.00	2500	-0.08				
250	0.00	2800	-0.07				
315	0.06	3150	-0.02				
400	0.06	3550	-0.04				
500	0.02	4000	-0.08				

Technician: Ed Devlin

Approval: Thomas A. Lee

Reference Equipment Used:

Manuf.	*Model*	*Serial*	*Cal. Date*	*Due Date*
GRAS	40AG	9542	2/22/2018	2/22/2019

ACCREDITED
Calibration Lab
CALIBRATION CERT 2649.01

Appendix D
Logan International Airport NWS Data

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Hourly Observations
September 2018

Generated on 09/25/2018

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 12 ft. Lat: 42.3606° N Lon: -71.0097° W

Station: **BOSTON, MA US 14739**

Date	Time (LST)	Station Type	Sky Conditions	Visibility	Weather Type (see documentation)	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Hum %	Wind Speed (MPH)	Wind Dir (Deg)	Wind Gusts (MPH)	Station Press (inHg)	Press. Tend	Net 3-Hr Change (inHg)	Sea Level Press. (inHg)	Report Type	Precip Total (in)	Altimeter Setting (inHg)
					AU | AW | MW	(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
13	0012	7	SCT:04 7 OVC:08 41	10.00		67	19.4	66	18.8	65	18.3	93	5	020		30.25				FM-16		30.28
13	0054	7	BKN:07 39 BKN:07 47 OVC:08 65	5.00	RA:02 BR:1 |RA |RA	67	19.4	66	18.8	65	18.3	93	5	020		30.25	5	+0.01	30.28	FM-15	0.02	30.28
13	0100	4	41	4.97	||RA	67	19.4	66	18.8	65	18.3	93	5	020		30.26	5	+0.01	30.28	FM-12		
13	0104	7	SCT:04 7 OVC:08 41	3.00	RA:02 BR:1 |RA |RA	67	19.4	66	18.8	65	18.3	93	6	360		30.25				FM-16	0.03	30.28
13	0113	7	SCT:04 6 BKN:07 22 OVC:08 41	2.50	RA:02 BR:1 |RA |RA	67	19.4	66	18.8	65	18.3	93	5	330		30.26				FM-16	0.06	30.29
13	0116	7	BKN:07 6 BKN:07 22 OVC:08 43	2.50	VCTS:7 +RA:02 BR:1 |RA |RA	67	19.4	66	18.8	65	18.3	93	6	330		30.26				FM-16	0.07	30.29
13	0129	7	BKN:07 8 BKN:07 24 OVC:08 90	3.00	RA:02 BR:1 |RA |RA	67	19.4	66	18.8	65	18.3	93	5	020		30.25				FM-16	0.11	30.28
13	0136	7	SCT:04 8 BKN:07 22 OVC:08 90	3.00	+RA:02 BR:1 |RA |RA	66	18.9	65	18.2	64	17.8	93	7	060		30.24				FM-16	0.13	30.27
13	0138	7	SCT:04 8 BKN:07 55 OVC:08 90	2.50	+RA:02 BR:1 |RA |RA	66	18.9	65	18.2	64	17.8	93	7	060		30.24				FM-16	0.14	30.27
13	0152	6	FEW:02 8 BKN:07 55 OVC:08 90	3.00	+RA:02 BR:1 |RA |RA	66	19.0	65	18.2	64	18.0	94	6	040		30.25				FM-16		30.28
13	0154	7	FEW:02 8 BKN:07 55 OVC:08 100	3.00	+RA:02 BR:1 |RA |RA	66	18.9	65	18.5	65	18.3	96	6	030		30.25			30.27	FM-15	0.22	30.28
13	0243	7	BKN:07 20 BKN:07 33 OVC:08 110	7.00	-RA:02 |RA |RA	66	18.9	65	18.2	64	17.8	93	5	020		30.25				FM-16	0.05	30.28
13	0254	7	BKN:07 19	7.00	-RA:02 |RA |RA	66	18.9	65	18.2	64	17.8	93	3	010		30.25			30.28	FM-15	0.05	30.28
13	0330	7	FEW:02 19 BKN:07 120	5.00	RA:02 BR:1 |RA |RA	66	18.9	65	18.2	64	17.8	93	7	020		30.24				FM-16	0.04	30.27
13	0354	7	BKN:07 110	5.00	RA:02 BR:1 |RA |RA	66	18.9	65	18.2	64	17.8	93	7	010		30.25	6	+0.00	30.28	FM-15	0.07	30.28
13	0400	4		4.97	||RA	66	18.9	65	18.2	64	17.8	93	7	010		30.26	6	+0.00	30.28	FM-12		
13	0404	7	SCT:04 6 SCT:04 70 BKN:07 110	4.00	RA:02 BR:1 |RA |RA	66	18.9	65	18.2	64	17.8	93	7	350		30.26				FM-16	0.02	30.29
13	0414	7	BKN:07 6 BKN:07 12 OVC:08 110	4.00	RA:02 BR:1 |RA |RA	66	18.9	65	18.2	64	17.8	93	8	330		30.27				FM-16	0.04	30.30
13	0454	7	BKN:07 7 BKN:07 12 OVC:08 110	3.00	-RA:02 BR:1 |RA |RA	66	18.9	65	18.2	64	17.8	93	7	020		30.27			30.30	FM-15	0.08	30.30
13	0501	7	FEW:02 7 BKN:07 14 OVC:08 21	9.00	-RA:02 |RA |RA	66	18.9	65	18.2	64	17.8	93	7	020		30.27				FM-16	0.01	30.30
13	0531	6	FEW:02 14 OVC:08 21	10.00		66	18.9	65	18.2	64	17.8	93	7	030		30.27				FM-16		30.30
13	0554	6	FEW:02 12 OVC:08 21	4.00	BR:1 ||	65	18.3	64	17.7	63	17.2	93	7	040		30.27			30.30	FM-15	T	30.30

13	0612	6	FEW:02 11 SCT:04 20 OVC:08 32	10.00		66	18.9	64	17.9	63	17.2	90	8	020		30.27				FM-16		30.30
13	0652	6	FEW:02 12 OVC:08 20	10.00		66	19.0	64	17.9	63	17.0	88	5	010		30.28				FM-16		30.31
13	0654	7	FEW:02 12 OVC:08 20	10.00		67	19.4	65	18.1	63	17.2	87	5	010		30.28	1	-0.03	30.31	SY-MT	0.00	30.31
13	0754	7	FEW:02 12 OVC:08 23	10.00		68	20.0	65	18.3	63	17.2	84	0	000		30.30			30.32	FM-15	0.00	30.33
13	0854	7	FEW:02 12 OVC:08 24	10.00		68	20.0	65	18.3	63	17.2	84	6	090		30.30			30.33	FM-15	0.00	30.33
13	0923	7	FEW:02 12 SCT:04 24 OVC:08 31	10.00		69	20.6	65	18.5	63	17.2	81	6	130		30.30				FM-16		30.33
13	0954	7	FEW:02 12 BKN:07 31 OVC:08 38	10.00		69	20.6	65	18.5	63	17.2	81	7	060		30.30	0	-0.02	30.33	FM-15	0.00	30.33
13	1000	4	15	9.94		69	20.6	65	18.5	63	17.2	81	7	060		30.31	9	0.02	30.33	FM-12		
13	1009	7	BKN:07 22 OVC:08 33	10.00		69	20.6	65	18.5	63	17.2	81	7	080		30.30				FM-16		30.33
13	1054	7	BKN:07 19 OVC:08 30	10.00		69	20.6	66	18.8	64	17.8	84	7	080		30.29			30.32	FM-15	0.00	30.32
13	1154	7	FEW:02 12 OVC:08 19	10.00		70	21.1	66	18.7	63	17.2	79	8	070		30.27			30.30	FM-15	0.00	30.30
13	1254	7	FEW:02 12 OVC:08 23	10.00		70	21.1	65	18.4	62	16.7	76	8	070		30.27	6	+0.03	30.29	FM-15	0.00	30.30
13	1300	4	15	9.94		70	21.1	65	18.4	62	16.7	76	8	070		30.28	6	+0.03	30.29	FM-12		
13	1354	7	FEW:02 10 BKN:07 17 OVC:08 23	10.00		70	21.1	65	18.1	61	16.1	73	6	090		30.27			30.29	FM-15	0.00	30.30
13	1454	7	FEW:02 10 SCT:04 18 OVC:08 24	10.00		70	21.1	65	18.4	62	16.7	76	5	VRB		30.27			30.29	FM-15	0.00	30.30
13	1554	7	FEW:02 11 OVC:08 24	10.00		70	21.1	65	18.4	62	16.7	76	6	080		30.26	6	+0.01	30.29	FM-15	0.00	30.29
13	1600	4	15	9.94		70	21.1	65	18.4	62	16.7	76	6	080		30.27	6	+0.01	30.29	FM-12		
13	1619	7	FEW:02 12 SCT:04 25 BKN:07 34	10.00		70	21.1	65	18.4	62	16.7	76	5	090		30.26				FM-16		30.29
13	1654	7	SCT:04 25 SCT:04 41	10.00		70	21.1	65	18.4	62	16.7	76	5	070		30.25			30.28	FM-15	0.00	30.28
13	1754	7	FEW:02 25 SCT:04 39 SCT:04 75	10.00		68	20.0	64	18.0	62	16.7	81	6	150		30.25			30.27	FM-15	0.00	30.28
13	1854	7	FEW:02 23 FEW:02 40 SCT:04 75	10.00		68	20.0	64	17.7	61	16.1	78	6	160		30.25	5	+0.01	30.28	FM-15	0.00	30.28
13	1900	4	26	9.94		68	20.0	64	17.7	61	16.1	78	6	160		30.26	5	+0.01	30.28	FM-12		
13	1954	7	FEW:02 25 FEW:02 70	10.00		68	20.0	64	17.7	61	16.1	78	5	200		30.26			30.29	FM-15	0.00	30.29
13	2054	7	FEW:02 13 SCT:04 22 BKN:07 130	10.00		69	20.6	65	18.2	62	16.7	78	3	260		30.26			30.29	FM-15	0.00	30.29
13	2154	7	SCT:04 22	10.00		67	19.4	64	17.8	62	16.7	84	5	190		30.25	0	-0.00	30.28	FM-15	0.00	30.28
13	2200	4	26	9.94		67	19.4	64	17.8	62	16.7	84	5	190		30.26	9	0.00	30.28	FM-12		
13	2254	7	SCT:04 22	10.00		66	18.9	64	17.5	62	16.7	87	0	000		30.24			30.27	FM-15	0.00	30.27
13	2354	7	CLR:00	10.00		65	18.3	63	17.3	62	16.7	90	0	000		30.24			30.27	FM-15	0.00	30.27
14	0054	7	CLR:00	10.00		66	18.9	64	17.5	62	16.7	87	0	000		30.24	6	+0.02	30.27	FM-15	0.00	30.27
14	0100	4		9.94		66	18.9	64	17.5	62	16.7	87	0	000		30.25	6	+0.02	30.27	FM-12		
14	0154	7	CLR:00	10.00		66	18.9	64	17.5	62	16.7	87	5	300		30.23			30.26	FM-15	0.00	30.26
14	0254	7	OVC:08 37	10.00		66	18.9	64	17.9	63	17.2	90	5	300		30.23			30.26	FM-15	0.00	30.26
14	0352	6	OVC:08 27	10.00		66	19.0	64	17.9	63	17.0	88	5	280		30.24				FM-16		30.27
14	0354	7	OVC:08 27	10.00		67	19.4	65	18.1	63	17.2	87	3	280		30.24	3	-0.00	30.27	FM-15	0.00	30.27

14	0400	4	26	9.94		67	19.4	65	18.1	63	17.2	87	3	280		30.25	3	-0.00	30.27	FM-12		
14	0454	7	OVC:08 27	10.00		67	19.4	65	18.1	63	17.2	87	3	010		30.25			30.27	FM-15	0.00	30.28
14	0554	7	OVC:08 30	8.00		67	19.4	65	18.4	64	17.8	91	0	000		30.26			30.28	FM-15	0.00	30.29
14	0654	7	OVC:08 31	7.00		68	20.0	66	18.6	64	17.8	87	3	360		30.26	2	-0.01	30.29	FM-15	0.00	30.29
14	0700	4	26	6.84		68	20.0	66	18.6	64	17.8	87	3	360		30.27	2	-0.01	30.29	FM-12		
14	0754	7	BKN:07 35	7.00		71	21.7	67	19.2	64	17.8	79	3	030		30.25			30.28	FM-15	0.00	30.28
14	0854	7	FEW:02 20 BKN:07 35	9.00		73	22.8	68	20.0	65	18.3	76	3	060		30.25			30.28	FM-15	0.00	30.28
14	0954	7	FEW:02 18 BKN:07 33	10.00		74	23.3	68	20.2	65	18.3	74	6	100		30.25	6	+0.01	30.28	FM-15	0.00	30.28
14	1000	4	15	9.94		74	23.3	68	20.2	65	18.3	74	6	100		30.26	6	+0.01	30.28	FM-12		
14	1054	7	FEW:02 18 BKN:07 33	10.00		73	22.8	68	20.0	65	18.3	76	10	080		30.24			30.27	FM-15	0.00	30.27
14	1154	7	SCT:04 18 BKN:07 33	10.00		72	22.2	68	20.1	66	18.9	82	14	090		30.24			30.27	FM-15	0.00	30.27
14	1225	7	FEW:02 5 SCT:04 15 BKN:07 34	7.00		72	22.2	68	20.1	66	18.9	82	11	100		30.24				FM-16		30.27
14	1250	7	BKN:07 5 BKN:07 15 BKN:07 45	6.00	HZ:7 |FU |HZ	72	22.0	68	20.1	66	19.0	83	10	080		30.23				FM-16		30.26
14	1254	7	BKN:07 5 BKN:07 15 BKN:07 45	5.00	HZ:7 |FU |HZ	71	21.7	68	19.9	66	18.9	84	11	080		30.23	6	+0.02	30.26	FM-15	0.00	30.26
14	1300	4	5	4.97	||HZ	71	21.7	68	19.9	66	18.9	84	11	080		30.24	6	+0.02	30.26	FM-12		
14	1301	7	BKN:07 3 OVC:08 45	5.00	BR:1 ||	70	21.1	67	19.7	66	18.9	87	10	090		30.23				FM-16		30.26
14	1319	7	BKN:07 3 OVC:08 45	1.50V	BR:1 ||	70	21.1	67	19.7	66	18.9	87	9	080		30.23				FM-16		30.26
14	1352	6	FEW:02 3 SCT:04 45 BKN:07 85	1.50V	HZ:7 ||HZ	70	21.0	66	19.0	64	18.0	83	8	070		30.22				FM-16		30.25
14	1354	7	FEW:02 3 SCT:04 45 BKN:07 85	6.00	|FU |HZ	70	21.1	67	19.4	65	18.3	84	8	070		30.22			30.24	FM-15	0.00	30.25
14	1454	7	FEW:02 3 SCT:04 40 BKN:07 85	5.00	|FU |HZ	70	21.1	67	19.4	65	18.3	84	10	070		30.20			30.23	FM-15	0.00	30.23
14	1554	7	FEW:02 6 SCT:04 33 SCT:04 85	10.00		70	21.1	67	19.4	65	18.3	84	10	080		30.20	6	+0.04	30.22	FM-15	0.00	30.23
14	1600	4	5	9.94		70	21.1	67	19.4	65	18.3	84	10	080		30.21	6	+0.04	30.22	FM-12		
14	1654	7	FEW:02 8 SCT:04 35 SCT:04 85	10.00		69	20.6	66	18.8	64	17.8	84	8	090		30.20			30.23	FM-15	0.00	30.23
14	1754	7	FEW:02 8 FEW:02 35 SCT:04 75	10.00		67	19.4	65	18.4	64	17.8	91	6	070		30.20			30.22	FM-15	0.00	30.23
14	1854	7	FEW:02 8 FEW:02 35 FEW:02 75	10.00		67	19.4	65	18.1	63	17.2	87	7	090		30.20	7	+0.00	30.22	FM-15	0.00	30.23
14	1900	4	8	9.94		67	19.4	65	18.1	63	17.2	87	7	090		30.21	7	+0.00	30.22	FM-12		
14	1954	7	FEW:02 8 FEW:02 35	10.00		67	19.4	65	18.4	64	17.8	91	6	110		30.20			30.23	FM-15	0.00	30.23
14	2054	7	FEW:02 8	10.00		66	18.9	65	18.2	64	17.8	93	3	120		30.20			30.23	FM-15	0.00	30.23
14	2154	7	CLR:00	10.00		66	18.9	64	17.9	63	17.2	90	3	160		30.20	1	-0.01	30.23	FM-15	0.00	30.23
14	2200	4		9.94		66	18.9	64	17.9	63	17.2	90	3	160		30.21	1	-0.01	30.23	FM-12		
14	2254	7	CLR:00	10.00		65	18.3	64	17.7	63	17.2	93	0	000		30.20			30.23	FM-15	0.00	30.23
14	2354	7	CLR:00	10.00		66	18.9	64	17.9	63	17.2	90	0	000		30.19			30.22	FM-15	0.00	30.22
15	0041	7	FEW:02 6 BKN:07 25	10.00		65	18.3	64	17.7	63	17.2	93	3	150		30.20				FM-16		30.23
15	0052	6	BKN:07 6 BKN:07 25	10.00		66	19.0	64	17.9	63	17.0	88	3	140		30.19				FM-16		30.22

15	0054	7	BKN:07 6 BKN:07 25	10.00		66	18.9	64	17.9	63	17.2	90	3	160		30.19	6	+0.01	30.22	FM-15	0.00	30.22
15	0100	4	5	9.94		66	18.9	64	17.9	63	17.2	90	3	160		30.20	6	+0.01	30.22	FM-12		
15	0135	7	OVC:08 4	8.00		65	18.3	64	17.7	63	17.2	93	3	150		30.19				FM-16		30.22
15	0152	6	SCT:04 4	7.00		64	18.0	63	17.4	63	17.0	94	3	140		30.18				FM-16		30.21
15	0154	7	SCT:04 4	7.00		65	18.3	64	17.7	63	17.2	93	0	000		30.18			30.21	FM-15	0.00	30.21
15	0252	6	BKN:07 3	5.00	BR:1 ||	64	18.0	63	17.4	63	17.0	94	5	160		30.18				FM-16		30.21
15	0254	7	BKN:07 3	5.00	BR:1 ||	64	17.8	63	17.1	62	16.7	93	5	150		30.18			30.20	FM-15	0.00	30.21
15	0304	7	BKN:07 2	1.25	BR:1 ||	64	17.8	63	17.4	63	17.2	96	5	160		30.17				FM-16		30.20
15	0310	7	VV:09 2	0.25	FG:2 |FG |	64	17.8	63	17.4	63	17.2	96	0	000		30.17				FM-16		30.20
15	0318	7	VV:09 1	0.00	FG:2 |FG |	64	17.8	63	17.4	63	17.2	96	3	180		30.17				FM-16		30.20
15	0328	7	VV:09 3	0.25	FG:2 |FG |	63	17.2	62	16.9	62	16.7	97	3	190		30.17				FM-16		30.20
15	0339	7	BKN:07 3 OVC:08 7	0.50	FG:2 |FG |	64	17.8	63	17.1	62	16.7	93	3	160		30.17				FM-16		30.20
15	0344	7	OVC:08 7	1.00	BR:1 ||	64	17.8	63	17.4	63	17.2	96	0	000		30.17				FM-16		30.20
15	0348	7	OVC:08 7	3.00	BR:1 ||	64	18.0	63	17.4	63	17.0	94	3	140		30.17				FM-16		30.20
15	0354	7	OVC:08 7	4.00	BR:1 ||	65	18.3	64	17.7	63	17.2	93	3	150		30.17	6	+0.02	30.20	FM-15	0.00	30.20
15	0400	4	8	3.73		65	18.3	64	17.7	63	17.2	93	3	150		30.18	6	+0.02	30.20	FM-12		
15	0454	7	OVC:08 5	4.00	BR:1 ||	65	18.3	64	18.0	64	17.8	97	0	000		30.18			30.21	FM-15	T	30.21
15	0544	7	OVC:08 3	2.00	BR:1 ||	65	18.3	64	18.0	64	17.8	97	3	150		30.19				FM-16		30.22
15	0554	7	OVC:08 3	2.00	BR:1 ||	65	18.3	64	18.0	64	17.8	97	3	170		30.19			30.22	FM-15	0.00	30.22
15	0615	7	OVC:08 3	0.75	BR:1 ||	65	18.3	64	18.0	64	17.8	97	6	160		30.20				FM-16		30.23
15	0626	7	OVC:08 3	0.25V	FG:2 |FG |	65	18.3	64	18.0	64	17.8	97	6	140		30.20				FM-16		30.23
15	0652	7	VV:09 2	0.12V s	FG:2 s |FG s |	64	18.0	64	17.8	64	18.0	100	7	130		30.20				FM-16		30.23
15	0654	7	VV:09 2	0.12s	FG:2 s |FG s |	65	18.3	64	18.0	64	17.8	97	7	130		30.20	1	-0.01	30.22	FM-15	0.00	30.23
15	0700	4	2	0.12	||FG	65	18.3	64	18.0	64	17.8	97	7	130		30.21	1	-0.01	30.22	FM-12		
15	0717	7	VV:09 2	0.12s	FG:2 s |FG s |	65	18.3	64	18.0	64	17.8	97	6	130		30.19				FM-16		30.22
15	0754	7	OVC:08 2	0.12s	FG:2 s |FG s |	65	18.3	64	18.0	64	17.8	97	5	120		30.19			30.22	FM-15	0.00	30.22
15	0854	7	OVC:08 3	0.12	BR:1 ||	66	18.9	65	18.2	64	17.8	93	3	150		30.20			30.22	FM-15	0.00	30.23
15	0916	6	OVC:08 4	1.00	BR:1 ||	66	18.9	65	18.2	64	17.8	93	3	150		30.20				FM-16		30.23
15	0952	6	OVC:08 5	1.00	BR:1 ||	66	19.0	65	18.2	64	18.0	94	3	150		30.20				FM-16		30.23
15	0954	7	OVC:08 5	1.00	BR:1 ||	67	19.4	65	18.4	64	17.8	91	3	150		30.20	6	+0.00	30.22	FM-15	0.00	30.23
15	1000	4	5	0.99		67	19.4	65	18.4	64	17.8	91	3	150		30.21	6	+0.00	30.22	FM-12		
15	1007	7	OVC:08 6	2.50	BR:1 ||	67	19.4	65	18.4	64	17.8	91	5	150		30.20				FM-16		30.23
15	1045	7	OVC:08 6	3.00	BR:1 ||	68	20.0	66	18.6	64	17.8	87	6	120		30.19				FM-16		30.22
15	1054	7	OVC:08 6	3.00	BR:1 ||	68	20.0	66	18.6	64	17.8	87	6	120		30.19			30.22	FM-15	0.00	30.22
15	1154	6	OVC:08 9	3.00	BR:1 ||	70	21.1	67	19.4	65	18.3	84	0	000		30.18			30.21	FM-15	0.00	30.21
15	1204	6	BKN:07 10 OVC:08 16	3.00	BR:1 ||	70	21.1	67	19.4	65	18.3	84	3	110		30.18				FM-16		30.21
15	1221	6	SCT:04 10 OVC:08 16	3.00		70	21.1	67	19.4	65	18.3	84	5	130		30.18				FM-16		30.21
15	1254	7	FEW:02 11 OVC:08 16	3.00		71	21.7	67	19.6	65	18.3	81	6	120		30.18	7	+0.02	30.20	SY-MT	0.00	30.21
15	1354	6	BKN:07 22 BKN:07 50	3.00		72	22.2	68	20.1	66	18.9	82	9	100		30.16			30.19	FM-15	0.00	30.19
15	1404	6	SCT:04 22 SCT:04 50	3.00		72	22.2	68	20.1	66	18.9	82	8	110		30.16				FM-16		30.19
15	1454	6	FEW:02 23	8.00		71	21.7	67	19.6	65	18.3	81	9	090		30.16			30.19	FM-15	0.00	30.19
15	1554	6	FEW:02 25	10.00		71	21.7	67	19.2	64	17.8	79	9	080		30.15	6	+0.02	30.18	FM-15	0.00	30.18
15	1654	6	FEW:02 25	10.00		70	21.1	66	19.0	64	17.8	82	10	110		30.16			30.18	FM-15	0.00	30.19
15	1754	6	FEW:02 20	10.00		69	20.6	65	18.5	63	17.2	81	9	110		30.15			30.18	FM-15	0.00	30.18
15	1854	6	FEW:02 20	10.00		68	20.0	65	18.3	63	17.2	84	7	120		30.15	7	+0.00	30.18	FM-15	0.00	30.18
15	1954	6	CLR:00	10.00		67	19.4	65	18.1	63	17.2	87	5	150		30.16			30.18	FM-15	0.00	30.19
15	2054	6	CLR:00	10.00		67	19.4	64	17.8	62	16.7	84	6	170		30.16			30.18	FM-15	0.00	30.19
15	2154	7	CLR:00	10.00		66	18.9	64	17.5	62	16.7	87	0	000		30.16	1	-0.00	30.18	FM-15	0.00	30.19
15	2200	4		9.94		66	18.9	64	17.5	62	16.7	87	0	000		30.17	1	-0.00	30.18	FM-12		
15	2254	7	FEW:02 10	10.00		67	19.4	65	18.1	63	17.2	87	7	220		30.15			30.18	FM-15	0.00	30.18

15	2354	7	FEW:02 10	10.00		65	18.3	63	17.3	62	16.7	90	7	200		30.15			30.18	FM-15	0.00	30.18
16	0054	7	FEW:02 10	10.00		64	17.8	62	16.8	61	16.1	90	7	200		30.14	8	+0.01	30.17	FM-15	0.00	30.17
16	0100	4	15	9.94		64	17.8	62	16.8	61	16.1	90	7	200		30.15	8	+0.01	30.17	FM-12		
16	0154	7	CLR:00	10.00		65	18.3	63	17.3	62	16.7	90	7	220		30.14			30.16	FM-15	0.00	30.17
16	0254	7	CLR:00	10.00		64	17.8	62	16.8	61	16.1	90	6	220		30.14			30.16	FM-15	0.00	30.17
16	0354	7	FEW:02 3	10.00		64	17.8	62	16.8	61	16.1	90	7	220		30.15	3	-0.00	30.17	FM-15	0.00	30.18
16	0400	4	2	9.94		64	17.8	62	16.8	61	16.1	90	7	220		30.16	4	0.00	30.17	FM-12		
16	0454	7	CLR:00	10.00		63	17.2	62	16.6	61	16.1	93	6	230		30.16			30.19	FM-15	0.00	30.19
16	0554	7	FEW:02 60	10.00		65	18.3	63	17.3	62	16.7	90	0	000		30.17			30.19	FM-15	0.00	30.20
16	0654	7	CLR:00	8.00		67	19.4	65	18.1	63	17.2	87	0	000		30.17	1	-0.02	30.19	FM-15	0.00	30.20
16	0700	4		7.46		67	19.4	65	18.1	63	17.2	87	0	000		30.18	1	-0.02	30.19	FM-12		
16	0754	7	CLR:00	10.00		70	21.1	66	19.0	64	17.8	82	5	220		30.17			30.20	FM-15	0.00	30.20
16	0854	7	FEW:02 50	9.00		74	23.3	69	20.5	66	18.9	76	5	140		30.18			30.21	FM-15	0.00	30.21
16	0954	7	FEW:02 40	10.00		76	24.4	70	20.9	66	18.9	72	6	140		30.18	0	-0.01	30.21	FM-15	0.00	30.21
16	1000	4	41	9.94		76	24.4	70	20.9	66	18.9	72	6	140		30.19	9	0.01	30.21	FM-12		
16	1054	7	FEW:02 40	10.00		77	25.0	70	21.0	66	18.9	69	9	130		30.17			30.19	FM-15	0.00	30.20
16	1154	7	FEW:02 40	10.00		81	27.2	71	21.8	66	18.9	61	7	130		30.17			30.19	FM-15	0.00	30.20
16	1254	7	FEW:02 40	10.00		81	27.2	72	22.4	68	20.0	65	8	100		30.16	6	+0.02	30.18	SY-MT	0.00	30.19
16	1354	6	FEW:02 45	10.00		79	26.1	71	21.7	67	19.4	67	10	110		30.15			30.17	FM-15	0.00	30.18
16	1454	6	FEW:02 40	10.00		80	26.7	69	20.6	63	17.2	56	13	110		30.14			30.17	FM-15	0.00	30.17
16	1554	7	FEW:02 40	10.00		80	26.7	67	19.4	59	15.0	49	13	110		30.14	6	+0.01	30.17	FM-15	0.00	30.17
16	1600	4	41	9.94		80	26.7	67	19.4	59	15.0	49	13	110		30.15	6	+0.01	30.17	FM-12		
16	1654	7	FEW:02 30	10.00		77	25.0	69	20.7	65	18.3	66	10	100		30.14			30.17	FM-15	0.00	30.17
16	1754	7	FEW:02 120	10.00		74	23.3	68	19.8	64	17.8	71	8	110		30.14			30.17	FM-15	0.00	30.17
16	1854	7	CLR:00	10.00		74	23.3	68	19.8	64	17.8	71	6	140		30.15	3	-0.01	30.18	FM-15	0.00	30.18
16	1900	4		9.94		74	23.3	68	19.8	64	17.8	71	6	140		30.16	3	-0.01	30.18	FM-12		
16	1954	7	CLR:00	10.00		73	22.8	69	20.3	66	18.9	79	6	190		30.17			30.19	FM-15	0.00	30.20
16	2054	7	CLR:00	10.00		73	22.8	70	21.0	68	20.0	84	7	200		30.17			30.20	FM-15	0.00	30.20
16	2154	6	CLR:00	10.00		71	21.7	68	20.2	67	19.4	87	6	190		30.18	1	-0.03	30.20	FM-15	0.00	30.21
16	2254	6	CLR:00	10.00		70	21.1	67	19.7	66	18.9	87	7	190		30.17			30.20	FM-15	0.00	30.20
16	2354	6	CLR:00	10.00		69	20.6	67	19.5	66	18.9	90	9	200		30.17			30.19	FM-15	0.00	30.20
17	0052	6	FEW:02 4	10.00		68	20.0	66	18.6	64	18.0	88	8	190		30.16				FM-16		30.19
17	0054	6	FEW:02 4	10.00		68	20.0	66	19.0	65	18.3	90	8	190		30.16	8	+0.02	30.18	FM-15	0.00	30.19
17	0140	6	BKN:07 4	7.00		68	20.0	67	19.3	66	18.9	93	8	200		30.15				FM-16		30.18
17	0154	6	OVC:08 4	6.00	BR:1 ||	68	20.0	67	19.3	66	18.9	93	8	190		30.14			30.17	FM-15	0.00	30.17
17	0217	6	OVC:08 3	2.50	BR:1 ||	68	20.0	67	19.3	66	18.9	93	9	190		30.14				FM-16		30.17
17	0240	6	OVC:08 2	3.00	BR:1 ||	68	20.0	67	19.3	66	18.9	93	9	200		30.14				FM-16		30.17
17	0254	6	OVC:08 2	3.00	BR:1 ||	68	20.0	67	19.3	66	18.9	93	9	200		30.13			30.16	FM-15	0.00	30.16
17	0341	6	OVC:08 2	1.50	BR:1 ||	68	20.0	67	19.3	66	18.9	93	7	210		30.13				FM-16		30.16
17	0354	6	OVC:08 2	1.50	BR:1 ||	68	20.0	67	19.3	66	18.9	93	8	200		30.13	6	+0.03	30.15	FM-15	0.00	30.16
17	0439	6	OVC:08 3	7.00		68	20.0	67	19.3	66	18.9	93	11	200		30.12				FM-16		30.15
17	0454	6	OVC:08 4	7.00		68	20.0	67	19.3	66	18.9	93	9	200		30.12			30.15	FM-15	0.00	30.15
17	0516	6	OVC:08 5	7.00		68	20.0	67	19.3	66	18.9	93	10	220		30.13				FM-16		30.16
17	0554	6	BKN:07 7	8.00		69	20.6	66	19.2	65	18.3	87	11	220		30.13			30.16	FM-15	0.00	30.16
17	0614	6	SCT:04 8	9.00		69	20.6	66	19.2	65	18.3	87	10	220		30.13				FM-16		30.16
17	0654	6	FEW:02 9 FEW:02 35 FEW:02 200	10.00		70	21.1	67	19.4	65	18.3	84	8	220		30.12	8	+0.00	30.15	FM-15	0.00	30.15
17	0754	6	FEW:02 9 SCT:04 41 SCT:04 250	10.00		73	22.8	69	20.3	66	18.9	79	9	210		30.12			30.14	FM-15	0.00	30.15
17	0854	6	FEW:02 46 BKN:07 250	10.00		75	23.9	70	21.0	67	19.4	76	11	230		30.10			30.13	FM-15	0.00	30.13
17	0954	6	FEW:02 50 SCT:04 250	10.00		79	26.1	71	21.4	66	18.9	65	10	240		30.09	8	+0.03	30.12	FM-15	0.00	30.12
17	1054	6	FEW:02 50 SCT:04 250	10.00		82	27.8	70	21.3	64	17.8	55	9	230		30.07			30.09	FM-15	0.00	30.10

17	1154	6	FEW:02 50 BKN:07 250	10.00		82	27.8	70	21.0	63	17.2	53	10	220		30.05			30.07	FM-15	0.00	30.08
17	1254	6	FEW:02 40 FEW:02 95 BKN:07 210	10.00		83	28.3	70	21.2	63	17.2	51	15	210		30.02	8	+0.07	30.05	FM-15	0.00	30.05
17	1354	6	FEW:02 40 FEW:02 95 BKN:07 210	10.00		83	28.3	69	20.6	61	16.1	48	14	240		30.00			30.03	FM-15	0.00	30.03
17	1454	6	FEW:02 33 FEW:02 130 BKN:07 210	10.00		83	28.3	69	20.6	61	16.1	48	17	210		29.98			30.01	FM-15	0.00	30.01
17	1554	6	FEW:02 33 SCT:04 130 BKN:07 210	10.00		82	27.8	70	21.0	63	17.2	53	15	230	22	29.97	6	+0.05	30.00	FM-15	0.00	30.00
17	1654	6	FEW:02 75 SCT:04 130 BKN:07 210	10.00		80	26.7	69	20.6	63	17.2	56	13	230		29.97			29.99	FM-15	0.00	30.00
17	1754	6	FEW:02 75 SCT:04 130 BKN:07 210	10.00		77	25.0	69	20.7	65	18.3	66	8	210		29.96			29.98	FM-15	0.00	29.99
17	1854	6	FEW:02 75 SCT:04 130 BKN:07 210	10.00		75	23.9	70	21.0	67	19.4	76	10	200		29.95	8	+0.02	29.98	FM-15	0.00	29.98
17	1954	6	SCT:04 130 OVC:08 200	10.00		74	23.3	69	20.8	67	19.4	79	10	210		29.94			29.97	FM-15	0.00	29.97
17	2054	6	SCT:04 130 OVC:08 200	10.00		74	23.3	70	21.2	68	20.0	82	10	210		29.94			29.96	FM-15	0.00	29.97
17	2154	6	SCT:04 130 OVC:08 200	10.00		73	22.8	70	21.0	68	20.0	84	8	210		29.93	8	+0.02	29.95	FM-15	0.00	29.96
17	2243	6	BKN:07 12	10.00		73	22.8	70	21.3	69	20.6	87	10	210		29.93				FM-16		29.96
17	2252	6	SCT:04 12	10.00		73	23.0	71	21.7	70	21.0	89	10	200		29.92				FM-16		29.95
17	2254	6	SCT:04 12	10.00		73	22.8	70	21.3	69	20.6	87	10	210		29.92			29.95	FM-15	0.00	29.95
17	2354	6	FEW:02 75 SCT:04 90 BKN:07 110	10.00	-RA:02 |RA |RA	73	22.8	70	21.3	69	20.6	87	11	220		29.91			29.94	FM-15	T	29.94
18	0054	6	OVC:08 95	10.00	-RA:02 |RA |RA	73	22.8	71	21.7	70	21.1	90	9	220		29.90	8	+0.02	29.93	FM-15	T	29.93
18	0154	6	BKN:07 75 OVC:08 85	3.00	RA:02 BR:1 |RA |RA	72	22.2	71	21.5	70	21.1	94	7	210		29.89			29.91	FM-15	0.03	29.92
18	0245	6	BKN:07 13 OVC:08 90	9.00		72	22.2	71	21.5	70	21.1	94	0	000		29.87				FM-16		29.90
18	0254	6	OVC:08 12	8.00	-RA:02 |RA |RA	72	22.2	71	21.5	70	21.1	94	0	000		29.87			29.89	FM-15	0.01	29.90
18	0316	6	OVC:08 9	8.00	-RA:02 |RA |RA	72	22.2	71	21.5	70	21.1	94	0	000		29.86				FM-16		29.89
18	0354	7	OVC:08 8	3.00	-RA:02 BR:1 |RA |RA	71	21.7	70	20.9	69	20.6	94	7	080		29.84	8	+0.06	29.87	SY-MT	0.03	29.87
18	0454	6	OVC:08 6	3.00	-RA:02 BR:1 |RA |RA	71	21.7	70	21.3	70	21.1	96	6	090		29.82			29.85	FM-15	0.12	29.85
18	0509	6	FEW:02 4 SCT:04 9 OVC:08 17	5.00	BR:1 ||	71	21.7	70	21.3	70	21.1	96	9	110		29.81				FM-16		29.84
18	0538	7	FEW:02 4 BKN:07 12 OVC:08 17	5.00	BR:1 ||	71	21.7	70	21.3	70	21.1	96	9	100		29.79				FM-16	T	29.82
18	0546	7	FEW:02 4 BKN:07 12 OVC:08 17	2.00	BR:1 ||	71	21.7	70	20.9	69	20.6	94	9	110		29.79				FM-16	T	29.82
18	0554	7	FEW:02 4 OVC:08 12	6.00	BR:1 ||	71	21.7	70	21.3	70	21.1	96	10	110		29.79			29.81	FM-15	T	29.82
18	0654	7	BKN:07 12 OVC:08 22	9.00	-RA:02 |RA |RA	74	23.3	72	22.2	71	21.7	91	10	180		29.76	8	+0.08	29.78	FM-15	0.02	29.79
18	0700	4	15	8.70	||RA	74	23.3	72	22.2	71	21.7	91	10	180		29.77	8	+0.08	29.78	FM-12		
18	0754	7	BKN:07 13 BKN:07 29 OVC:08 34	10.00		76	24.4	73	22.9	72	22.2	88	13	200		29.72			29.75	FM-15	T	29.75
18	0838	7	BKN:07 15 OVC:08 22	10.00		77	25.0	74	23.5	73	22.8	88	11	200		29.70				FM-16	T	29.73

18	0854	7	BKN:07 15 OVC:08 21	10.00		77	25.0	74	23.5	73	22.8	88	14	200		29.70			29.72	FM-15	T	29.73
18	0952	6	BKN:07 17 OVC:08 26	5.00	VCTS:7 -RA:02 BR:1 |RA |RA	75	24.0	74	23.1	73	23.0	94	18	200		29.67				FM-16		29.70
18	0954	7	BKN:07 17 OVC:08 26	5.00	-RA:02 BR:1 |RA |RA	76	24.4	74	23.3	73	22.8	91	15	200		29.66	8	+0.09	29.69	FM-15	0.05s	29.69
18	1000	4	15	4.97	||RA	76	24.4	74	23.3	73	22.8	91	15	200		29.67	8	+0.09	29.69	FM-12		
18	1000	7	BKN:07 14 BKN:07 19 OVC:08 26	2.50	-RA:02 BR:1 |RA |RA	76	24.4	74	23.3	73	22.8	91	18	190		29.67				FM-16	0.03	29.70
18	1003	7	BKN:07 14 BKN:07 19 OVC:08 24	0.75	VCTS:7 -RA:02 BR:1 |RA |RA	76	24.4	74	23.3	73	22.8	91	32	VRB	48	29.69				FM-16	0.03	29.72
18	1005	7	BKN:07 11 OVC:08 17	0.50	+RA:02 FG:2 |FG RA |RA	74	23.3	72	22.2	71	21.7	91	22	350	48	29.68				FM-16	0.03	29.71
18	1009	6	FEW:02 12 BKN:07 17	0.50	+RA:02 FG:2 |FG RA |RA	71	21.7	70	20.9	69	20.6	94	16	010	48	29.69				FM-16		29.72
18	1020	7	SCT:04 12 OVC:08 19	1.00	TS:7 +RA:02 BR:1 |RA TS |RA	70	21.1	69	20.7	69	20.6	97	7	020		29.69				FM-16	0.43	29.72
18	1031	7	SCT:04 5 SCT:04 12 OVC:08 16	2.00	TS:7 -RA:02 BR:1 |RA TS |RA	71	21.7	70	20.9	69	20.6	94	10	360		29.69				FM-16	0.48	29.72
18	1049	7	FEW:02 5 BKN:07 16 OVC:08 30	1.50	+RA:02 BR:1 |RA |RA	70	21.0	69	20.4	68	20.0	94	0	000		29.70				FM-16	0.54	29.73
18	1052	6	FEW:02 5 BKN:07 16 OVC:08 30	0.75V	+RA:02 BR:1 |RA |RA	70	21.0	69	20.4	68	20.0	94	0	000		29.70				FM-16		29.73
18	1054	7	FEW:02 5 BKN:07 16 OVC:08 30	0.75	+RA:02 BR:1 |RA |RA	70	21.1	69	20.7	69	20.6	97	5	040		29.69			29.72	FM-15	0.63	29.72
18	1059	7	FEW:02 5 BKN:07 26 OVC:08 75	1.25	TS:7 -RA:02 BR:1 |RA TS |RA	70	21.1	69	20.4	68	20.0	93	5	010		29.69				FM-16	0.06	29.72
18	1124	7	BKN:07 8 OVC:08 33	10.00	TS:7 -RA:02 |RA TS TS |RA	71	21.7	69	20.6	68	20.0	90	7	VRB		29.70				FM-16	0.12	29.73
18	1154	7	BKN:07 8 BKN:07 33 OVC:08 70	10.00	TS:7 -RA:02 |RA TS TS |RA	71	21.7	69	20.6	68	20.0	90	3	020		29.70			29.72	FM-15	0.08	29.73
18	1234	6	BKN:07 7 OVC:08 33	3.00	RA:02 BR:1 |RA |RA	71	21.7	69	20.6	68	20.0	90	6	040		29.68				FM-16		29.71
18	1254	7	BKN:07 7 OVC:08 33	5.00	-RA:02 BR:1 |RA |RA	71	21.7	70	20.9	69	20.6	94	6	010		29.70	0	-0.03	29.72	FM-15	0.12	29.73
18	1300	4	8	4.97	||RA	71	21.7	70	20.9	69	20.6	94	6	010		29.71	9	0.03	29.72	FM-12		
18	1354	7	BKN:07 7 OVC:08 13	4.00	RA:02 BR:1 |RA |RA	71	21.7	69	20.6	68	20.0	90	7	360		29.69			29.72	FM-15	0.03	29.72
18	1418	6	SCT:04 7 BKN:07 13 BKN:07 20	7.00	-RA:02 |RA |RA	71	21.7	69	20.6	68	20.0	90	5	360		29.71				FM-16		29.74
18	1436	7	FEW:02 7 BKN:07 16 BKN:07 22	6.00	|RA |RA	72	22.2	69	20.8	68	20.0	87	3	350		29.72				FM-16	0.04	29.75
18	1454	7	FEW:02 7 BKN:07 19 BKN:07 80	7.00		72	22.2	69	20.8	68	20.0	87	0	000		29.72			29.75	FM-15	0.03	29.75
18	1525	7	FEW:02 10 SCT:04 19 BKN:07 80	8.00		73	22.8	70	21.3	69	20.6	87	0	000		29.73				FM-16		29.76
18	1541	7	FEW:02 6 BKN:07 10 BKN:07 80	10.00		73	22.8	70	21.0	68	20.0	84	3	300		29.72				FM-16		29.75
18	1554	7	FEW:02 6 BKN:07 10 BKN:07 80	10.00		73	22.8	70	21.3	69	20.6	87	3	330		29.72	0	-0.02	29.75	FM-15	0.00	29.75
18	1600	4	5	9.94		73	22.8	70	21.3	69	20.6	87	3	330		29.73	9	0.02	29.75	FM-12		

18	1654	7	FEW:02 7 BKN:07 11 BKN:07 130	10.00		73	22.8	70	21.3	69	20.6	87	5	160		29.70			29.73	FM-15	0.00	29.73
18	1706	7	FEW:02 7 SCT:04 11 BKN:07 130	10.00		73	22.8	70	21.3	69	20.6	87	5	150		29.70				FM-16		29.73
18	1754	7	FEW:02 7 FEW:02 16 SCT:04 80	10.00		73	22.8	70	21.0	68	20.0	84	3	320		29.71			29.73	FM-15	0.00	29.74
18	1854	7	FEW:02 13 FEW:02 80 SCT:04 130	10.00		72	22.2	69	20.8	68	20.0	87	5	140		29.72	3	-0.00	29.75	FM-15	0.00	29.75
18	1900	4	15	9.94		72	22.2	69	20.8	68	20.0	87	5	140		29.73	3	-0.00	29.75	FM-12		
18	1954	7	FEW:02 11 SCT:04 130 BKN:07 210	10.00		72	22.2	70	21.1	69	20.6	91	5	270		29.73			29.75	FM-15	0.00	29.76
18	2054	7	FEW:02 11 SCT:04 130 BKN:07 210	10.00		72	22.2	69	20.8	68	20.0	87	0	000		29.73			29.75	FM-15	0.00	29.76
18	2154	7	FEW:02 11 SCT:04 130 BKN:07 210	10.00		70	21.1	68	20.0	67	19.4	90	5	200		29.74	3	-0.01	29.76	FM-15	0.00	29.77
18	2200	4	15	9.94		70	21.1	68	20.0	67	19.4	90	5	200		29.75	3	-0.01	29.76	FM-12		
18	2254	7	FEW:02 130	10.00		69	20.6	68	19.8	67	19.4	93	5	190		29.73			29.76	FM-15	0.00	29.76
18	2354	7	CLR:00	10.00		69	20.6	68	19.8	67	19.4	93	0	000		29.73			29.76	FM-15	0.00	29.76
19	0054	7	CLR:00	10.00		70	21.1	68	20.0	67	19.4	90	3	330		29.74	5	+0.00	29.76	FM-15	0.00	29.77
19	0100	4		9.94		70	21.1	68	20.0	67	19.4	90	3	330		29.75	5	+0.00	29.76	FM-12		
19	0146	7	BKN:07 10	10.00		71	21.7	68	20.2	67	19.4	87	11	350		29.75				FM-16		29.78
19	0154	7	BKN:07 10	10.00		71	21.7	68	20.2	67	19.4	87	10	360		29.75			29.78	FM-15	0.00	29.78
19	0203	7	OVC:08 8	10.00		70	21.1	69	20.4	68	20.0	93	11	020		29.75				FM-16		29.78
19	0237	7	OVC:08 4	7.00		69	20.6	68	19.8	67	19.4	93	15	020		29.76				FM-16		29.79
19	0252	6	OVC:08 3	1.50	BR:1 ||	68	20.0	67	19.3	66	19.0	94	13	020		29.76				FM-16		29.79
19	0254	7	OVC:08 3	1.50	BR:1 ||	68	20.0	67	19.6	67	19.4	96	13	020		29.76			29.79	FM-15	0.00	29.79
19	0342	7	OVC:08 4	3.00	BR:1 ||	65	18.3	64	18.0	64	17.8	97	20	030		29.79				FM-16	T	29.82
19	0354	7	OVC:08 4	3.00	BR:1 ||	65	18.3	64	17.7	63	17.2	93	20	030		29.79	3	-0.06	29.82	FM-15	T	29.82
19	0400	4	5	2.98		65	18.3	64	17.7	63	17.2	93	20	030		29.80	3	-0.06	29.82	FM-12		
19	0454	7	OVC:08 4	3.00	BR:1 ||	64	17.8	63	17.1	62	16.7	93	18	010	22	29.83			29.85	FM-15	0.00	29.86
19	0501	7	OVC:08 7	6.00	BR:1 ||	64	17.8	62	16.8	61	16.1	90	16	020		29.83				FM-16		29.86
19	0552	6	BKN:07 10 OVC:08 17	10.00		63	17.0	62	16.6	61	16.0	94	17	020		29.85				FM-16		29.88
19	0554	7	BKN:07 10 OVC:08 17	10.00		63	17.2	61	16.2	60	15.6	90	16	020		29.85			29.88	FM-15	0.00	29.88
19	0614	7	BKN:07 9 OVC:08 19	9.00		63	17.2	61	16.2	60	15.6	90	15	030		29.85				FM-16		29.88
19	0654	7	OVC:08 9	10.00		63	17.2	61	15.9	59	15.0	87	16	030		29.86	1	-0.07	29.89	FM-15	0.00	29.89
19	0700	4	8	9.94		63	17.2	61	15.9	59	15.0	87	16	030		29.87	1	-0.07	29.89	FM-12		
19	0754	7	OVC:08 8	8.00		63	17.2	61	16.2	60	15.6	90	11	020		29.89			29.92	FM-15	0.00	29.92
19	0826	7	OVC:08 8	2.50V	BR:1 ||	63	17.2	61	16.2	60	15.6	90	14	020		29.91				FM-16		29.94
19	0843	7	BKN:07 8 OVC:08 13	9.00		63	17.2	61	16.2	60	15.6	90	15	040		29.91				FM-16	T	29.94
19	0852	6	BKN:07 10 OVC:08 14	10.00		63	17.0	61	15.9	59	15.0	88	14	040		29.91				FM-16		29.94
19	0854	7	BKN:07 10 OVC:08 14	10.00		63	17.2	61	15.9	59	15.0	87	14	030		29.92			29.94	FM-15	T	29.95
19	0954	7	OVC:08 10	9.00		63	17.2	61	15.9	59	15.0	87	11	040		29.94	1	-0.07	29.96	FM-15	0.00	29.97
19	1000	4	15	8.70		63	17.2	61	15.9	59	15.0	87	11	040		29.95	1	-0.07	29.96	FM-12		
19	1015	7	OVC:08 9	10.00		64	17.8	61	16.1	59	15.0	84	13	030		29.94				FM-16		29.97
19	1054	7	OVC:08 9	3.00	-DZ:01 |DZ |DZ	63	17.2	61	15.9	59	15.0	87	9	050		29.94			29.97	FM-15	T	29.97
19	1141	7	OVC:08 10	9.00		63	17.2	61	15.9	59	15.0	87	11	040		29.95				FM-16	T	29.98
19	1154	7	BKN:07 10 OVC:08 17	10.00		64	17.8	61	16.1	59	15.0	84	9	040		29.94			29.97	FM-15	T	29.97

19	1211	7	OVC:08 15	7.00		65	18.3	61	16.4	59	15.0	81	11	040		29.95				FM-16		29.98
19	1230	7	BKN:07 11 OVC:08 18	10.00		64	17.8	61	15.8	58	14.4	81	13	050		29.95				FM-16		29.98
19	1254	7	BKN:07 13 OVC:08 27	10.00		64	17.8	61	15.8	58	14.4	81	13	050		29.95	1	-0.01	29.97	FM-15	0.00	29.98
19	1300	4	15	9.94		64	17.8	61	15.8	58	14.4	81	13	050		29.96	1	-0.01	29.97	FM-12		
19	1327	7	BKN:07 17 OVC:08 27	10.00		64	17.8	61	15.8	58	14.4	81	11	030		29.94				FM-16		29.97
19	1354	7	BKN:07 16 OVC:08 28	10.00		64	17.8	60	15.5	57	13.9	78	10	050		29.95			29.97	FM-15	0.00	29.98
19	1454	7	BKN:07 18 BKN:07 41	10.00		64	17.8	60	15.5	57	13.9	78	10	070		29.96			29.99	FM-15	0.00	29.99
19	1510	7	SCT:04 23 BKN:07 50 BKN:07 140	10.00		65	18.3	60	15.5	56	13.3	73	10	070		29.96				FM-16		29.99
19	1554	7	SCT:04 23 BKN:07 50 BKN:07 140	10.00		65	18.3	60	15.5	56	13.3	73	10	050		29.96	3	-0.02	29.99	FM-15	0.00	29.99
19	1600	4	26	9.94		65	18.3	60	15.5	56	13.3	73	10	050		29.97	3	-0.02	29.99	FM-12		
19	1654	6	FEW:02 10 SCT:04 22 BKN:07 50	10.00		63	17.2	58	14.7	55	12.8	75	11	040		30.00			30.03	FM-15	0.00	30.03
19	1717	6	FEW:02 10 BKN:07 19 BKN:07 50	10.00		63	17.2	58	14.7	55	12.8	75	10	030		30.01				FM-16		30.04
19	1742	6	FEW:02 10 SCT:04 19 BKN:07 50	10.00		63	17.2	58	14.7	55	12.8	75	9	040		30.01				FM-16		30.04
19	1754	6	SCT:04 19 BKN:07 33 BKN:07 50	10.00		63	17.2	58	14.7	55	12.8	75	8	040		30.01			30.04	FM-15	0.00	30.04
19	1854	7	FEW:02 12 BKN:07 32 BKN:07 50	10.00		63	17.2	58	14.7	55	12.8	75	13	050		30.03	1	-0.06	30.06	SY-MT	0.00	30.06
19	1954	6	FEW:02 13 BKN:07 33 BKN:07 50	10.00		63	17.2	59	15.0	56	13.3	78	11	040		30.05			30.07	FM-15	0.00	30.08
19	2054	6	SCT:04 21 BKN:07 33 OVC:08 50	10.00		63	17.2	58	14.7	55	12.8	75	11	040		30.06			30.08	FM-15	0.00	30.09
19	2154	7	FEW:02 22 OVC:08 50	10.00		62	16.7	58	14.2	54	12.2	75	13	050		30.06	1	-0.03	30.09	SY-MT	0.00	30.09
19	2241	6	FEW:02 21 BKN:07 27	10.00		62	16.7	58	14.5	55	12.8	78	13	020		30.07				FM-16		30.10
19	2254	6	FEW:02 21 OVC:08 27	10.00		62	16.7	58	14.5	55	12.8	78	9	010		30.07			30.10	FM-15	0.00	30.10
19	2354	6	FEW:02 22 BKN:07 30 BKN:07 37	10.00		62	16.7	58	14.5	55	12.8	78	8	360		30.09			30.12	FM-15	0.00	30.12
20	0054	7	SCT:04 17 BKN:07 32 BKN:07 55	10.00		62	16.7	59	14.8	56	13.3	80	7	350		30.10	1	-0.04	30.12	SY-MT	0.00	30.13
20	0117	6	SCT:04 17 BKN:07 22 BKN:07 37	10.00		61	16.1	58	14.5	56	13.3	84	13	030		30.09				FM-16		30.12
20	0154	6	BKN:07 17 BKN:07 35	10.00		62	16.7	59	14.8	56	13.3	80	13	040		30.10			30.13	FM-15	0.00	30.13
20	0254	6	FEW:02 13 BKN:07 22	10.00		61	16.1	58	14.5	56	13.3	84	13	010		30.11			30.14	FM-15	0.00	30.14
20	0354	7	SCT:04 13 BKN:07 22	10.00		60	15.6	58	14.3	56	13.3	86	13	020		30.12	2	-0.02	30.14	SY-MT	0.00	30.15
20	0454	7	SCT:04 13 BKN:07 49	10.00		61	16.1	58	14.5	56	13.3	84	13	030		30.13			30.15	FM-15	0.00	30.16

20	0516	7	SCT:04 13 BKN:07 19 BKN:07 40	10.00		61	16.1	58	14.5	56	13.3	84	11	030		30.13				FM-16		30.16
20	0554	7	SCT:04 16 BKN:07 23	10.00		61	16.1	58	14.5	56	13.3	84	11	030		30.15			30.17	FM-15	0.00	30.18
20	0647	7	FEW:02 13 SCT:04 24 SCT:04 45	10.00		61	16.1	58	14.5	56	13.3	84	11	030		30.17				FM-16		30.20
20	0654	7	FEW:02 13 SCT:04 24 SCT:04 45	10.00		61	16.1	58	14.5	56	13.3	84	13	040		30.18	3	-0.06	30.20	FM-15	0.00	30.21
20	0700	4	15	9.94		61	16.1	58	14.5	56	13.3	84	13	040		30.19	3	-0.06	30.20	FM-12		
20	0732	7	FEW:02 14 BKN:07 24	10.00		63	17.2	59	15.0	56	13.3	78	15	030		30.19				FM-16		30.22
20	0752	6	FEW:02 13 SCT:04 24	10.00		64	18.0	60	15.5	57	14.0	78	10	030		30.20				FM-16		30.23
20	0754	7	FEW:02 13 SCT:04 24	10.00		64	17.8	60	15.5	57	13.9	78	13	020		30.20			30.22	FM-15	0.00	30.23
20	0851	7	SCT:04 17 BKN:07 28	10.00		64	18.0	59	14.9	55	13.0	73	11	020		30.23				FM-16		30.26
20	0854	7	SCT:04 17 BKN:07 28	10.00		65	18.3	60	15.5	56	13.3	73	13	030		30.23			30.26	FM-15	0.00	30.26
20	0954	7	BKN:07 20 BKN:07 28	10.00		65	18.3	60	15.5	56	13.3	73	17	030		30.24	1	-0.04	30.26	FM-15	0.00	30.27
20	1000	4	26	9.94		65	18.3	60	15.5	56	13.3	73	17	030		30.25	1	-0.04	30.26	FM-12		
20	1054	7	BKN:07 16 OVC:08 38	10.00		63	17.2	59	15.0	56	13.3	78	11	060		30.25			30.27	FM-15	T	30.28
20	1154	7	FEW:02 20 BKN:07 27 OVC:08 32	10.00		64	17.8	59	15.2	56	13.3	75	11	070		30.25			30.27	FM-15	0.00	30.28
20	1228	7	SCT:04 19 OVC:08 46	10.00		64	17.8	59	15.2	56	13.3	75	15	070		30.24				FM-16		30.27
20	1254	7	SCT:04 19 OVC:08 46	10.00		65	18.3	60	15.5	56	13.3	73	14	080		30.23	8	+0.00	30.26	FM-15	0.00	30.26
20	1300	4	15	9.94		65	18.3	60	15.5	56	13.3	73	14	080		30.24	4	0.00	30.26	FM-12		
20	1354	7	FEW:02 17 BKN:07 45 BKN:07 110	10.00		65	18.3	59	15.2	55	12.8	70	14	080		30.23			30.26	FM-15	0.00	30.26
20	1454	6	FEW:02 17 SCT:04 45 BKN:07 110	10.00		64	17.8	59	14.9	55	12.8	73	14	080		30.23			30.25	FM-15	0.00	30.26
20	1554	7	SCT:04 17 BKN:07 45 BKN:07 110	10.00		64	17.8	59	15.2	56	13.3	75	11	080		30.24	3	-0.00	30.27	FM-15	0.00	30.27
20	1600	4	15	9.94		64	17.8	59	15.2	56	13.3	75	11	080		30.25	3	-0.00	30.27	FM-12		
20	1614	7	BKN:07 19 BKN:07 110 BKN:07 210	10.00		63	17.2	58	14.7	55	12.8	75	13	090		30.23				FM-16		30.26
20	1654	7	BKN:07 19 BKN:07 130 BKN:07 210	10.00		63	17.2	58	14.7	55	12.8	75	10	100		30.24			30.27	FM-15	0.00	30.27
20	1754	7	SCT:04 19 BKN:07 29 OVC:08 130	10.00		63	17.2	58	14.7	55	12.8	75	7	080		30.26			30.29	FM-15	0.00	30.29
20	1843	7	FEW:02 17 SCT:04 29 BKN:07 47	10.00		63	17.2	58	14.4	54	12.2	73	8	080		30.26				FM-16		30.29
20	1854	7	FEW:02 17 SCT:04 31 BKN:07 50	10.00		63	17.2	58	14.4	54	12.2	73	8	090		30.26	0	-0.02	30.28	FM-15	0.00	30.29
20	1900	4	15	9.94		63	17.2	58	14.4	54	12.2	73	8	090		30.27	9	0.02	30.28	FM-12		
20	1954	7	FEW:02 17 SCT:04 50 BKN:07 130	10.00		63	17.2	58	14.4	54	12.2	73	9	100		30.27			30.29	FM-15	0.00	30.30

20	2054	7	FEW:02 17 SCT:04 50 BKN:07 140	10.00		63	17.2	57	14.1	53	11.7	70	8	100		30.27			30.30	FM-15	0.00	30.30
20	2154	7	FEW:02 50 BKN:07 140 OVC:08 180	10.00		63	17.2	57	14.1	53	11.7	70	11	120		30.26	0	-0.01	30.29	FM-15	0.00	30.29
20	2200	4	57	9.94		63	17.2	57	14.1	53	11.7	70	11	120		30.27	9	0.01	30.29	FM-12		
20	2254	7	FEW:02 50 BKN:07 160 OVC:08 190	10.00		63	17.2	58	14.4	54	12.2	73	6	130		30.28			30.31	FM-15	0.00	30.31
20	2354	7	FEW:02 50 BKN:07 160 OVC:08 190	10.00		63	17.2	57	14.1	53	11.7	70	6	150		30.28			30.31	FM-15	0.00	30.31
21	0054	7	OVC:08 50	10.00		62	16.7	58	14.2	54	12.2	75	5	150		30.27	0	-0.01	30.30	FM-15	0.00	30.30
21	0100	4	57	9.94		62	16.7	58	14.2	54	12.2	75	5	150		30.28	9	0.01	30.30	FM-12		
21	0154	7	OVC:08 55	10.00		62	16.7	58	14.2	54	12.2	75	5	160		30.26			30.29	FM-15	0.00	30.29
21	0254	7	BKN:07 55 OVC:08 140	10.00		62	16.7	58	14.2	54	12.2	75	6	150		30.26			30.29	FM-15	0.00	30.29
21	0354	7	SCT:04 55 OVC:08 140	10.00		62	16.7	57	13.9	53	11.7	73	6	160		30.26	5	+0.01	30.29	FM-15	0.00	30.29
21	0400	4	57	9.94		62	16.7	57	13.9	53	11.7	73	6	160		30.27	5	+0.01	30.29	FM-12		
21	0454	7	SCT:04 50 BKN:07 140	10.00		62	16.7	57	13.6	52	11.1	70	7	160		30.27			30.29	FM-15	0.00	30.30
21	0554	7	FEW:02 35 BKN:07 100 BKN:07 220	10.00		62	16.7	57	13.9	53	11.7	73	8	180		30.28			30.30	FM-15	0.00	30.31
21	0654	7	FEW:02 35 BKN:07 100	10.00		62	16.7	57	13.9	53	11.7	73	8	180		30.28	1	-0.01	30.31	FM-15	0.00	30.31
21	0700	4	41	9.94		62	16.7	57	13.9	53	11.7	73	8	180		30.29	1	-0.01	30.31	FM-12		
21	0754	7	FEW:02 35 SCT:04 100 SCT:04 160	10.00		64	17.8	58	14.4	53	11.7	68	8	170		30.28			30.30	FM-15	0.00	30.31
21	0854	7	FEW:02 30 SCT:04 90 SCT:04 160	10.00		66	18.9	59	14.8	53	11.7	63	11	160		30.26			30.29	FM-15	0.00	30.29
21	0954	7	FEW:02 30 SCT:04 70 SCT:04 160	10.00		67	19.4	59	15.1	53	11.7	61	9	150		30.22	8	+0.06	30.25	FM-15	0.00	30.25
21	1000	4	26	9.94		67	19.4	59	15.1	53	11.7	61	9	150		30.23	8	+0.06	30.25	FM-12		
21	1054	7	FEW:02 30 FEW:02 70 SCT:04 250	10.00		69	20.6	59	15.2	52	11.1	55	10	160		30.19			30.22	FM-15	0.00	30.22
21	1154	7	FEW:02 30 FEW:02 70 SCT:04 250	10.00		71	21.7	61	16.2	54	12.2	55	10	170		30.16			30.19	FM-15	0.00	30.19
21	1254	7	SCT:04 35 BKN:07 60 BKN:07 250	10.00		71	21.7	62	16.5	55	12.8	57	11	210		30.13	8	+0.10	30.16	FM-15	0.00	30.16
21	1300	4	41	9.94		71	21.7	62	16.5	55	12.8	57	11	210		30.14	8	+0.10	30.16	FM-12		
21	1354	7	SCT:04 32 BKN:07 55 BKN:07 250	10.00		70	21.1	62	16.6	56	13.3	61	14	200		30.10			30.12	FM-15	0.00	30.13
21	1454	7	FEW:02 29 BKN:07 48 BKN:07 250	10.00		70	21.1	61	16.0	54	12.2	57	17	200		30.07			30.10	FM-15	0.00	30.10
21	1554	7	FEW:02 26 OVC:08 48	10.00		68	20.0	61	16.1	56	13.3	65	17	190		30.04	6	+0.09	30.07	FM-15	0.00	30.07
21	1600	4	26	9.94		68	20.0	61	16.1	56	13.3	65	17	190		30.05	6	+0.09	30.07	FM-12		
21	1654	7	FEW:02 28 OVC:08 46	10.00		67	19.4	61	16.2	57	13.9	71	15	200	22	30.02			30.05	FM-15	0.00	30.05
21	1754	7	FEW:02 27 BKN:07 50 OVC:08 250	10.00		66	18.9	61	16.0	57	13.9	73	18	190		29.99			30.02	FM-15	0.00	30.02

21	1854	7	FEW:02 32 BKN:07 49 OVC:08 250	10.00		67	19.4	62	16.8	59	15.0	76	17	200		29.96	8	+0.08	29.99	FM-15	0.00	29.99
21	1900	4	26	9.94		67	19.4	62	16.8	59	15.0	76	17	200		29.97	8	+0.08	29.99	FM-12		
21	1954	7	FEW:02 13 SCT:04 35 BKN:07 140	10.00		67	19.4	63	17.1	60	15.6	79	16	200		29.94			29.97	FM-15	0.00	29.97
21	2054	7	FEW:02 14 SCT:04 37 BKN:07 140	10.00		68	20.0	64	17.6	61	16.1	78	18	210	25	29.94			29.97	FM-15	0.00	29.97
21	2154	7	SCT:04 43 BKN:07 140	10.00		69	20.6	65	18.2	62	16.7	78	17	210	24	29.92	8	+0.04	29.95	FM-15	0.00	29.95
21	2200	4	41	9.94		69	20.6	65	18.2	62	16.7	78	17	210		29.93	8	+0.04	29.95	FM-12		
21	2254	7	FEW:02 37	10.00		69	20.6	65	18.2	62	16.7	78	21	210	29	29.90			29.92	FM-15	0.00	29.93
21	2354	7	SCT:04 34 BKN:07 140	10.00		70	21.1	65	18.1	61	16.1	73	20	210	29	29.84			29.87	FM-15	0.00	29.87

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Current Location: Elev: 12 ft. Lat: 42.3606° N Lon: -71.0097° W
Station: **BOSTON, MA US 14739**

Local Climatological Data
Hourly Precipitation
September 2018

Generated on 09/25/2018

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Date	For Hour (LST) Ending at																							Date
	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	NOON	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	MID	
01																									01
02																									02
03																									03
04																									04
05																									05
06																T	0.01	0.02	T						06
07													T												07
08		T	T																						08
09																									09
10													T	T		0.01	0.01	0.10	0.10	0.07	0.13	0.14	0.09	0.11	10
11	0.14	0.14	0.07	0.07	0.10	0.01																			11
12		T	T		T	0.01						0.01	0.01	0.08	0.09	T						0.05s	0.01		12
13	0.02	0.22	0.05	0.07	0.08	T	M																		13
14																									14
15					T								M												15
16													M												16
17																								T	17
18	T	0.03	0.01	M	0.12	T	0.02	T	T	0.05s	0.63	0.08	0.12	0.03	0.03										18
19				T					T		T	T							M			M			19
20	M			M							T														20
21																									21
22			0.03	T																			M	M	22

Maximum Short Duration Precipitation

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (inches)												
Ending Date Time (yyyy-mm-dd hh:mi)												

Hourly, daily, and monthly totals on the Daily Summary page and the Hourly Precipitation Table are shown as reported by the instrumentation at the site. However, NWS does not edit hourly values for its ASOS sites, but may edit the daily and monthly totals for selected sites which will be reflected on the Daily Summary page.

T = Trace
s = Suspect
* = Erroneous
blank = No precipitation observed
M = Missing

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Current Location: Elev: 12 ft. Lat: 42.3606° N Lon: -71.0097° W

Station: **BOSTON, MA US 14739**

Local Climatological Data
Hourly Observations
September 2018

Generated on 10/11/2018

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Date	Time (LST)	Station Type	Sky Conditions	Visibility	Weather Type (see documentation)	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Hum %	Wind Speed (MPH)	Wind Dir (Deg)	Wind Gusts (MPH)	Station Press (inHg)	Press. Tend	Net 3-Hr Change (inHg)	Sea Level Press. (inHg)	Report Type	Precip Total (in)	Altimeter Setting (inHg)
					AU | AW | MW	(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
27	0054	7	FEW:02 20 BKN:07 50 OVC:08 65	4.00	-RA:02 BR:1 |RA |RA	70	21.1	68	20.0	67	19.4	90	3	260		29.91	1	-0.06	29.94	FM-15	0.05	29.94
27	0100	4	26	3.73	||RA	70	21.1	68	20.0	67	19.4	90	3	260		29.92	1	-0.06	29.94	FM-12		
27	0106	7	BKN:07 15 BKN:07 48 OVC:08 80	10.00		70	21.1	68	20.0	67	19.4	90	0	000		29.91				FM-16	T	29.94
27	0147	7	SCT:04 16 BKN:07 43 OVC:08 65	10.00		70	21.1	68	20.0	67	19.4	90	5	260		29.92				FM-16	T	29.95
27	0154	7	SCT:04 16 BKN:07 43 OVC:08 65	10.00		70	21.1	68	20.0	67	19.4	90	6	280		29.92			29.95	FM-15	T	29.95
27	0254	7	SCT:04 47 BKN:07 100 OVC:08 220	10.00		69	20.6	66	18.8	64	17.8	84	11	320		29.94			29.97	FM-15	0.00	29.97
27	0354	7	FEW:02 50 SCT:04 100 OVC:08 240	10.00		66	18.9	62	16.9	60	15.6	81	10	330	18	29.97	3	-0.06	29.99	FM-15	0.00	30.00
27	0400	4	57	9.94		66	18.9	62	16.9	60	15.6	81	10	330		29.98	3	-0.06	29.99	FM-12		
27	0454	7	BKN:07 50 BKN:07 100 OVC:08 240	10.00		64	17.8	60	15.5	57	13.9	78	11	330		30.00			30.03	FM-15	0.00	30.03
27	0554	7	BKN:07 44 BKN:07 160 BKN:07 250	10.00		63	17.2	59	15.0	56	13.3	78	13	330		30.04			30.06	FM-15	0.00	30.07
27	0654	7	FEW:02 26 BKN:07 44 BKN:07 160	10.00		63	17.2	58	14.7	55	12.8	75	11	340		30.06	1	-0.09	30.09	FM-15	0.00	30.09
27	0700	4	26	9.94		63	17.2	58	14.7	55	12.8	75	11	340		30.07	1	-0.09	30.09	FM-12		
27	0754	7	BKN:07 48 BKN:07 160 BKN:07 250	10.00		64	17.8	59	15.2	56	13.3	75	10	350		30.09			30.12	FM-15	0.00	30.12
27	0854	7	BKN:07 50 BKN:07 250	10.00		66	18.9	60	15.4	55	12.8	68	11	020		30.11			30.14	FM-15	0.00	30.14
27	0954	7	SCT:04 40 BKN:07 60 BKN:07 160	10.00		68	20.0	59	14.7	51	10.6	55	14	020		30.12	1	-0.06	30.15	FM-15	0.00	30.15
27	1000	4	41	9.94		68	20.0	59	14.7	51	10.6	55	14	020		30.13	1	-0.06	30.15	FM-12		
27	1054	7	SCT:04 41 SCT:04 160 BKN:07 250	10.00		69	20.6	58	14.7	50	10.0	51	11	040		30.12			30.15	FM-15	0.00	30.15
27	1154	7	FEW:02 44 FEW:02 170 SCT:04 250	10.00		68	20.0	59	15.0	52	11.1	57	11	090		30.12			30.15	FM-15	0.00	30.15
27	1254	7	FEW:02 50 BKN:07 250	10.00		67	19.4	60	15.6	55	12.8	66	13	070		30.11	8	+0.01	30.14	FM-15	0.00	30.14
27	1300	4	57	9.94		67	19.4	60	15.6	55	12.8	66	13	070		30.12	8	+0.01	30.14	FM-12		
27	1354	7	FEW:02 45 SCT:04 100 BKN:07 250	10.00		65	18.3	59	14.9	54	12.2	68	15	070		30.11			30.13	FM-15	0.00	30.14
27	1454	7	FEW:02 45 BKN:07 140 BKN:07 250	10.00		64	17.8	57	14.1	52	11.1	65	13	070		30.11			30.14	FM-15	0.00	30.14

27	1554	7	FEW:02 45 SCT:04 95 BKN:07 140	10.00		64	17.8	57	13.8	51	10.6	63	14	080		30.12	3	-0.01	30.14	FM-15	0.00	30.15
27	1600	4	41	9.94		64	17.8	57	13.8	51	10.6	63	14	080		30.13	3	-0.01	30.14	FM-12		
27	1654	7	FEW:02 45 SCT:04 95 BKN:07 140	10.00		63	17.2	55	13.0	49	9.4	60	10	060		30.10			30.12	FM-15	0.00	30.13
27	1754	7	FEW:02 95 BKN:07 140 BKN:07 250	10.00		62	16.7	54	12.3	47	8.3	58	10	060		30.11			30.13	FM-15	0.00	30.14
27	1854	7	FEW:02 95 BKN:07 140 OVC:08 250	10.00		61	16.1	56	13.4	52	11.1	72	7	070		30.14	3	-0.02	30.16	FM-15	0.00	30.17
27	1900	4		9.94		61	16.1	56	13.4	52	11.1	72	7	070		30.15	3	-0.02	30.16	FM-12		
27	1954	7	FEW:02 95 BKN:07 140 OVC:08 230	10.00		62	16.7	56	13.3	51	10.6	67	8	070		30.14			30.17	FM-15	0.00	30.17
27	2054	6	FEW:02 95 BKN:07 140 OVC:08 230	10.00		62	16.7	56	13.1	50	10.0	65	10	060		30.14			30.16	FM-15	0.00	30.17
27	2154	7	FEW:02 95 BKN:07 140	10.00		61	16.1	56	13.4	52	11.1	72	9	070		30.12	8	+0.01	30.15	FM-15	0.00	30.15
27	2200	4		9.94		61	16.1	56	13.4	52	11.1	72	9	070		30.13	8	+0.01	30.15	FM-12		
27	2254	7	BKN:07 120	10.00		62	16.7	57	13.9	53	11.7	73	10	070		30.11			30.13	FM-15	0.00	30.14
27	2354	7	SCT:04 85 OVC:08 110	10.00		62	16.7	56	13.6	52	11.1	70	15	070		30.07			30.09	FM-15	0.00	30.10
28	0054	7	OVC:08 80	10.00		62	16.7	57	13.9	53	11.7	73	10	050		30.09	5	+0.04	30.11	FM-15	T	30.12
28	0100	4	74	9.94		62	16.7	57	13.9	53	11.7	73	10	050		30.10	5	+0.04	30.11	FM-12		
28	0154	7	OVC:08 80	10.00		62	16.7	57	13.9	53	11.7	73	10	060		30.07			30.10	FM-15	0.00	30.10
28	0254	7	OVC:08 80	10.00		61	16.1	57	13.7	53	11.7	75	9	020		30.06			30.09	FM-15	0.00	30.09
28	0354	7	OVC:08 70	10.00		61	16.1	57	13.7	53	11.7	75	13	040		30.05	6	+0.03	30.08	FM-15	0.00	30.08
28	0400	4	74	9.94		61	16.1	57	13.7	53	11.7	75	13	040		30.06	6	+0.03	30.08	FM-12		
28	0454	7	FEW:02 20 OVC:08 70	10.00	-RA:02 |RA |RA	61	16.1	57	13.9	54	12.2	78	14	030		30.05			30.08	FM-15	T	30.08
28	0518	7	BKN:07 20 OVC:08 65	10.00		61	16.1	57	13.7	53	11.7	75	13	030		30.05				FM-16	T	30.08
28	0554	7	BKN:07 20 OVC:08 55	5.00	RA:02 |RA |RA	60	15.6	57	13.7	54	12.2	80	11	030		30.08			30.10	FM-15	0.01	30.11
28	0610	7	SCT:04 19 BKN:07 48 OVC:08 70	2.50	RA:02 BR:1 |RA |RA	59	15.0	57	13.8	55	12.8	87	8	030		30.08				FM-16	0.03	30.11
28	0632	7	SCT:04 19 BKN:07 50 OVC:08 90	3.00	-RA:02 BR:1 |RA |RA	59	15.0	57	13.8	55	12.8	87	9	030		30.08				FM-16	0.07	30.11
28	0654	7	BKN:07 19 BKN:07 55 OVC:08 110	3.00	+RA:02 BR:1 |RA |RA	59	15.0	57	13.8	55	12.8	87	10	040		30.08	3	-0.02	30.10	FM-15	0.13s	30.11
28	0700	4	15	2.98	||RA	59	15.0	57	13.8	55	12.8	87	10	040		30.09	3	-0.02	30.10	FM-12		
28	0754	7	BKN:07 20 BKN:07 60 OVC:08 120	3.00	RA:02 BR:1 |RA |RA	58	14.4	56	13.2	54	12.2	87	11	040		30.06			30.08	FM-15	0.10	30.09
28	0827	7	BKN:07 12 BKN:07 25 OVC:08 47	10.00	-RA:02 |RA |RA	59	15.0	57	14.1	56	13.3	90	10	020		30.06				FM-16	0.03	30.09
28	0854	7	BKN:07 11 BKN:07 23 OVC:08 47	10.00	-RA:02 |RA |RA	60	15.6	58	14.3	56	13.3	86	11	020		30.06			30.09	FM-15	0.02	30.09
28	0954	7	BKN:07 11 OVC:08 29	10.00	-RA:02 |RA |RA	60	15.6	58	14.3	56	13.3	86	11	020		30.06	6	+0.02	30.08	FM-15	T	30.09
28	1000	4	15	9.94	||RA	60	15.6	58	14.3	56	13.3	86	11	020		30.07	6	+0.02	30.08	FM-12		
28	1054	7	BKN:07 12 OVC:08 31	3.00	-RA:02 BR:1 |RA |RA	59	15.0	57	14.1	56	13.3	90	16	030		30.03			30.06	FM-15	0.08	30.06

28	1152	6	SCT:04 10 BKN:07 17 OVC:08 25	4.00	-RA:02 BR:1 |RA |RA	57	14.0	55	13.0	54	12.0	88	16	010		30.04				FM-16		30.07
28	1154	7	SCT:04 10 BKN:07 17 OVC:08 25	4.00	-RA:02 BR:1 |RA |RA	58	14.4	56	13.2	54	12.2	87	14	010		30.04			30.06	FM-15	T	30.07
28	1254	7	FEW:02 11 BKN:07 17 OVC:08 25	9.00	-RA:02 |RA |RA	58	14.4	54	12.4	51	10.6	78	14	020		30.03	6	+0.02	30.06	FM-15	T	30.06
28	1300	4	15	8.70	||RA	58	14.4	54	12.4	51	10.6	78	14	020		30.04	6	+0.02	30.06	FM-12		
28	1354	7	FEW:02 13 OVC:08 29	10.00	-RA:02 |RA |RA	60	15.6	55	12.8	51	10.6	72	9	040		30.02			30.04	FM-15	0.01	30.05
28	1427	7	FEW:02 13 OVC:08 36	10.00		60	15.6	55	12.8	51	10.6	72	11	020		30.02				FM-16	T	30.05
28	1454	7	FEW:02 11 SCT:04 16 OVC:08 39	6.00	-DZ:01 |DZ |DZ	59	15.0	56	13.5	54	12.2	83	7	010		30.02			30.04	FM-15	T	30.05
28	1509	7	FEW:02 11 BKN:07 16 OVC:08 32	10.00		59	15.0	56	13.5	54	12.2	83	3	050		30.01				FM-16	T	30.04
28	1554	7	FEW:02 12 BKN:07 26	10.00		60	15.6	56	13.4	53	11.7	78	6	060		30.01	6	+0.02	30.04	FM-15	T	30.04
28	1600	4	15	9.94		60	15.6	56	13.4	53	11.7	78	6	060		30.02	6	+0.02	30.04	FM-12		
28	1654	7	FEW:02 11 BKN:07 21	10.00		60	15.6	56	13.4	53	11.7	78	3	020		30.04			30.06	FM-15	0.00	30.07
28	1754	7	FEW:02 13 BKN:07 22	10.00		60	15.6	56	13.1	52	11.1	75	3	010		30.04			30.07	FM-15	0.00	30.07
28	1852	6	FEW:02 11 SCT:04 25	10.00		59	15.0	55	12.9	52	11.0	77	5	010		30.05				FM-16		30.08
28	1854	7	FEW:02 11 SCT:04 25	10.00		59	15.0	55	12.9	52	11.1	78	5	020		30.05	1	-0.04	30.07	FM-15	0.00	30.08
28	1900	4	15	9.94		59	15.0	55	12.9	52	11.1	78	5	020		30.06	1	-0.04	30.07	FM-12		
28	1954	7	CLR:00	10.00		59	15.0	55	12.6	51	10.6	75	3	040		30.05			30.08	FM-15	0.00	30.08
28	2054	7	FEW:02 24	10.00		59	15.0	55	12.9	52	11.1	78	3	240		30.05			30.08	FM-15	0.00	30.08
28	2154	7	FEW:02 24	10.00		59	15.0	56	13.2	53	11.7	81	5	280		30.05	1	-0.01	30.08	FM-15	0.00	30.08
28	2200	4	26	9.94		59	15.0	56	13.2	53	11.7	81	5	280		30.06	1	-0.01	30.08	FM-12		
28	2254	7	FEW:02 30	10.00		58	14.4	55	12.6	52	11.1	81	6	280		30.06			30.08	FM-15	0.00	30.09
28	2354	7	CLR:00	10.00		58	14.4	55	12.6	52	11.1	81	6	270		30.05			30.07	FM-15	0.00	30.08
29	0054	7	CLR:00	10.00		56	13.3	54	12.4	53	11.7	90	7	230		30.05	8	+0.00	30.08	FM-15	0.00	30.08
29	0100	4		9.94		56	13.3	54	12.4	53	11.7	90	7	230		30.06	8	+0.00	30.08	FM-12		
29	0154	7	CLR:00	10.00		56	13.3	54	12.1	52	11.1	87	9	220		30.04			30.07	FM-15	0.00	30.07
29	0254	7	CLR:00	10.00		56	13.3	54	12.1	52	11.1	87	8	240		30.05			30.07	FM-15	0.00	30.08
29	0354	7	CLR:00	10.00		55	12.8	53	11.9	52	11.1	90	6	230		30.06	3	-0.01	30.09	FM-15	0.00	30.09
29	0400	4		9.94		55	12.8	53	11.9	52	11.1	90	6	230		30.07	3	-0.01	30.09	FM-12		
29	0454	7	CLR:00	10.00		55	12.8	53	11.9	52	11.1	90	7	230		30.06			30.09	FM-15	0.00	30.09
29	0554	7	CLR:00	10.00		56	13.3	54	12.1	52	11.1	87	6	240		30.09			30.11	FM-15	0.00	30.12
29	0654	7	FEW:02 20	10.00		59	15.0	56	13.2	53	11.7	81	9	270		30.10	3	-0.04	30.13	FM-15	0.00	30.13
29	0700	4	26	9.94		59	15.0	56	13.2	53	11.7	81	9	270		30.11	3	-0.04	30.13	FM-12		
29	0754	7	FEW:02 18	10.00		61	16.1	57	13.7	53	11.7	75	10	270		30.11			30.14	FM-15	0.00	30.14
29	0854	7	FEW:02 18	10.00		65	18.3	59	15.2	55	12.8	70	6	VRB		30.12			30.15	FM-15	0.00	30.15
29	0954	7	FEW:02 25	10.00		69	20.6	60	15.8	54	12.2	59	7	320		30.12	0	-0.02	30.15	FM-15	0.00	30.15
29	1000	4	26	9.94		69	20.6	60	15.8	54	12.2	59	7	320		30.13	9	0.02	30.15	FM-12		
29	1054	7	FEW:02 25	10.00		70	21.1	61	16.0	54	12.2	57	8	270		30.10			30.13	FM-15	0.00	30.13
29	1154	7	SCT:04 30	10.00		72	22.2	62	16.7	55	12.8	55	10	300		30.10			30.13	FM-15	0.00	30.13
29	1254	6	SCT:04 41	10.00		72	22.2	62	16.4	54	12.2	53	7	280	18	30.09	6	+0.03	30.12	FM-15	0.00	30.12
29	1354	7	SCT:04 50	10.00		74	23.3	62	16.8	54	12.2	50	8	280		30.09			30.12	FM-15	0.00	30.12
29	1454	7	SCT:04 55	10.00		72	22.2	61	15.9	52	11.1	50	6	300		30.11			30.13	FM-15	0.00	30.14
29	1554	7	SCT:04 60	10.00		72	22.2	61	15.9	52	11.1	50	8	300		30.12	3	-0.03	30.15	FM-15	0.00	30.15
29	1600	4	57	9.94		72	22.2	61	15.9	52	11.1	50	8	300		30.13	3	-0.03	30.15	FM-12		
29	1654	7	SCT:04 65	10.00		69	20.6	58	14.7	50	10.0	51	9	300		30.14			30.16	FM-15	0.00	30.17

29	1754	7	SCT:04 55	10.00		68	20.0	58	14.5	50	10.0	53	9	310		30.15			30.18	FM-15	0.00	30.18
29	1854	7	SCT:04 50	10.00		67	19.4	58	14.2	50	10.0	55	3	330		30.17	2	-0.05	30.20	FM-15	0.00	30.20
29	1900	4	57	9.94		67	19.4	58	14.2	50	10.0	55	3	330		30.18	2	-0.05	30.20	FM-12		
29	1954	7	BKN:07 60	10.00		66	18.9	58	14.3	51	10.6	59	3	VRB		30.19			30.21	FM-15	0.00	30.22
29	2054	7	FEW:02 60	10.00		64	17.8	56	13.3	49	9.4	58	8	300		30.20			30.23	FM-15	0.00	30.23
29	2154	7	FEW:02 60	10.00		61	16.1	55	12.8	50	10.0	67	8	300		30.21	1	-0.04	30.24	FM-15	0.00	30.24
29	2200	4	57	9.94		61	16.1	55	12.8	50	10.0	67	8	300		30.22	1	-0.04	30.24	FM-12		
29	2254	7	FEW:02 60	10.00		60	15.6	54	12.0	48	8.9	65	8	290		30.22			30.24	FM-15	0.00	30.25
29	2354	7	CLR:00	10.00		60	15.6	53	11.5	46	7.8	60	8	320		30.22			30.25	FM-15	0.00	30.25
30	0054	7	FEW:02 60	10.00		58	14.4	52	11.3	47	8.3	67	8	330		30.23	1	-0.02	30.26	FM-15	0.00	30.26
30	0100	4	57	9.94		58	14.4	52	11.3	47	8.3	67	8	330		30.24	1	-0.02	30.26	FM-12		
30	0154	7	FEW:02 60	10.00		56	13.3	51	10.8	47	8.3	72	5	340		30.23			30.26	FM-15	0.00	30.26
30	0254	7	FEW:02 60	10.00		56	13.3	51	10.5	46	7.8	70	7	320		30.24			30.27	FM-15	0.00	30.27
30	0354	7	FEW:02 60	10.00		55	12.8	50	10.2	46	7.8	72	5	290		30.26	3	-0.03	30.29	FM-15	0.00	30.29
30	0400	4	57	9.94		55	12.8	50	10.2	46	7.8	72	5	290		30.27	3	-0.03	30.29	FM-12		
30	0454	7	FEW:02 60	10.00		55	12.8	50	9.7	44	6.7	67	8	290		30.27			30.29	FM-15	0.00	30.30
30	0554	7	FEW:02 60	10.00		54	12.2	49	9.5	44	6.7	69	9	300		30.29			30.31	FM-15	0.00	30.32
30	0654	7	FEW:02 50 FEW:02 180	10.00		57	13.9	50	10.3	44	6.7	62	10	300		30.29	1	-0.03	30.32	FM-15	0.00	30.32
30	0700	4	57	9.94		57	13.9	50	10.3	44	6.7	62	10	300		30.30	1	-0.03	30.32	FM-12		
30	0754	7	FEW:02 40 FEW:02 180	10.00		60	15.6	52	11.3	45	7.2	58	8	300		30.32			30.35	FM-15	0.00	30.35
30	0854	7	FEW:02 40 FEW:02 180	10.00		63	17.2	53	11.6	43	6.1	48	8	310		30.32			30.34	FM-15	0.00	30.35
30	0954	7	FEW:02 40 FEW:02 220	10.00		64	17.8	53	11.8	43	6.1	46	6	290		30.31	0	-0.02	30.34	FM-15	0.00	30.34
30	1000	4	41	9.94		64	17.8	53	11.8	43	6.1	46	6	290		30.32	9	0.02	30.34	FM-12		
30	1054	7	FEW:02 30 FEW:02 70 SCT:04 250	10.00		66	18.9	54	12.1	42	5.6	42	6	360		30.29			30.32	FM-15	0.00	30.32
30	1154	7	FEW:02 30 FEW:02 90 SCT:04 250	10.00		67	19.4	54	12.3	42	5.6	41	5	300		30.28			30.31	FM-15	0.00	30.31
30	1254	7	FEW:02 30 FEW:02 90 SCT:04 250	10.00		69	20.6	55	12.8	42	5.6	38	8	280		30.27	6	+0.04	30.30	FM-15	0.00	30.30
30	1300	4	26	9.94		69	20.6	55	12.8	42	5.6	38	8	280		30.28	6	+0.04	30.30	FM-12		
30	1354	7	SCT:04 70 SCT:04 80 BKN:07 220	10.00		69	20.6	55	12.5	41	5.0	36	13	260	18	30.25			30.27	FM-15	0.00	30.28
30	1454	7	BKN:07 220 BKN:07 250	10.00		69	20.6	55	13.0	43	6.1	39	9	240		30.25			30.27	FM-15	0.00	30.28
30	1554	7	FEW:02 180 BKN:07 220 BKN:07 250	10.00		69	20.6	55	12.8	42	5.6	38	9	250		30.25	5	+0.02	30.28	FM-15	0.00	30.28
30	1600	4		9.94		69	20.6	55	12.8	42	5.6	38	9	250		30.26	5	+0.02	30.28	FM-12		
30	1654	7	FEW:02 180 BKN:07 220 OVC:08 250	10.00		67	19.4	54	12.3	42	5.6	41	8	VRB		30.25			30.27	FM-15	0.00	30.28
30	1754	7	FEW:02 150 SCT:04 220 BKN:07 250	10.00		66	18.9	54	12.0	42	5.6	42	9	270		30.25			30.28	FM-15	0.00	30.28
30	1854	7	SCT:04 220 BKN:07 250	10.00		65	18.3	54	12.0	43	6.1	45	6	260		30.26	3	-0.01	30.29	FM-15	0.00	30.29
30	1900	4		9.94		65	18.3	54	12.0	43	6.1	45	6	260		30.27	3	-0.01	30.29	FM-12		
30	1954	7	FEW:02 220 BKN:07 250	10.00		62	16.7	54	12.3	47	8.3	58	5	200		30.26			30.29	FM-15	0.00	30.29
30	2054	7	FEW:02 220 SCT:04 250	10.00		61	16.1	54	12.0	47	8.3	60	5	200		30.26			30.29	FM-15	0.00	30.29
30	2154	7	BKN:07 250	10.00		60	15.6	54	12.3	49	9.4	67	6	220		30.27	3	-0.01	30.29	FM-15	0.00	30.30
30	2200	4		9.94		60	15.6	54	12.3	49	9.4	67	6	220		30.28	3	-0.01	30.29	FM-12		

30	2254	7	FEW:02 220 SCT:04 250	10.00		60	15.6	55	12.6	50	10.0	70	7	220		30.27			30.30	FM-15	0.00	30.30
30	2354	7	OVC:08 75	10.00		62	16.7	56	13.1	50	10.0	65	3	260		30.27			30.29	FM-15	0.00	30.30

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Local Climatological Data
Hourly Observations
October 2018

Generated on 10/11/2018

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 12 ft. Lat: 42.3606° N Lon: -71.0097° W

Station: **BOSTON, MA US 14739**

Date	Time (LST)	Station Type	Sky Conditions	Visibility	Weather Type (see documentation)	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Hum %	Wind Speed (MPH)	Wind Dir (Deg)	Wind Gusts (MPH)	Station Press (inHg)	Press. Tend	Net 3-Hr Change (inHg)	Sea Level Press. (inHg)	Report Type	Precip Total (in)	Altimeter Setting (inHg)
					AU | AW | MW	(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
01	0054	7	BKN:07 70 OVC:08 150	10.00		60	15.6	55	12.9	51	10.6	72	6	220		30.27	8	+0.00	30.29	FM-15	0.00	30.30
01	0100	4	74	9.94		60	15.6	55	12.9	51	10.6	72	6	220		30.28	8	+0.00	30.29	FM-12		
01	0154	7	OVC:08 65	10.00		60	15.6	56	13.1	52	11.1	75	8	210		30.25			30.28	FM-15	0.00	30.28
01	0254	7	OVC:08 70	10.00		61	16.1	57	13.7	53	11.7	75	7	210		30.25			30.28	FM-15	0.00	30.28
01	0354	7	BKN:07 70 BKN:07 220	10.00		61	16.1	57	13.7	53	11.7	75	6	220		30.26	5	+0.01	30.28	FM-15	0.00	30.29
01	0400	4	74	9.94		61	16.1	57	13.7	53	11.7	75	6	220		30.27	5	+0.01	30.28	FM-12		
01	0454	7	OVC:08 75	10.00		60	15.6	57	13.7	54	12.2	80	5	240		30.26			30.29	FM-15	0.00	30.29
01	0554	7	BKN:07 80	10.00		61	16.1	58	14.2	55	12.8	81	9	220		30.27			30.29	FM-15	0.00	30.30
01	0654	7	SCT:04 70 BKN:07 120 BKN:07 250	10.00		63	17.2	60	15.3	57	13.9	81	11	200		30.26	0	-0.01	30.29	FM-15	0.00	30.29
01	0700	4	74	9.94		63	17.2	60	15.3	57	13.9	81	11	200		30.27	9	0.01	30.29	FM-12		
01	0754	7	FEW:02 65 SCT:04 120 SCT:04 250	10.00		66	18.9	61	16.3	58	14.4	75	13	240		30.28			30.30	FM-15	0.00	30.31
01	0834	7	BKN:07 18 BKN:07 70	10.00		67	19.4	62	16.8	59	15.0	76	10	240		30.28				FM-16		30.31
01	0854	7	BKN:07 16 OVC:08 70	10.00		67	19.4	62	16.8	59	15.0	76	5	270		30.28			30.31	FM-15	0.00	30.31
01	0954	7	OVC:08 19	10.00		66	18.9	61	16.3	58	14.4	75	6	330		30.28	1	-0.02	30.31	FM-15	0.00	30.31
01	1000	4	15	9.94		66	18.9	61	16.3	58	14.4	75	6	330		30.29	1	-0.02	30.31	FM-12		
01	1054	7	OVC:08 20	10.00		66	18.9	61	16.3	58	14.4	75	10	350		30.29			30.31	FM-15	0.00	30.32
01	1154	7	OVC:08 16	10.00		62	16.7	58	14.2	54	12.2	75	11	040		30.29			30.32	FM-15	0.00	30.32
01	1201	7	OVC:08 14	10.00		62	16.7	58	14.2	54	12.2	75	11	020		30.29				FM-16		30.32
01	1254	7	OVC:08 14	7.00	BR:1 ||	61	16.1	57	13.9	54	12.2	78	9	030		30.29	0	-0.01	30.31	FM-15	0.00	30.32
01	1300	4	15	6.84		61	16.1	57	14.0	54	12.2	78	9	030		30.30	9	0.01	30.31	FM-12		
01	1340	7	FEW:02 14 OVC:08 18	10.00		60	15.6	57	13.7	54	12.2	80	10	030		30.28				FM-16		30.31
01	1354	7	FEW:02 13 OVC:08 16	10.00		60	15.6	56	13.4	53	11.7	78	9	030		30.29			30.31	FM-15	0.00	30.32
01	1434	7	FEW:02 11 OVC:08 15	2.50	-RA:02 BR:1 |RA |RA	59	15.0	56	13.5	54	12.2	83	9	030		30.29				FM-16	T	30.32
01	1451	7	BKN:07 11 OVC:08 15	1.75	-RA:02 BR:1 |RA |RA	57	14.0	56	13.3	55	13.0	94	10	020		30.29				FM-16	T	30.32
01	1454	7	BKN:07 9 OVC:08 14	1.75	-RA:02 BR:1 |RA |RA	58	14.4	56	13.5	55	12.8	90	10	020		30.29			30.31	FM-15	T	30.32
01	1503	7	SCT:04 6 OVC:08 11	2.50	-RA:02 BR:1 |RA |RA	58	14.4	57	13.8	56	13.3	93	11	030		30.29				FM-16	T	30.32
01	1518	7	BKN:07 6 OVC:08 13	2.00	-RA:02 BR:1 |RA |RA	58	14.4	56	13.5	55	12.8	90	8	040		30.29				FM-16	T	30.32
01	1538	7	BKN:07 6 OVC:08 11	1.50	-RA:02 BR:1 |RA |RA	58	14.4	56	13.5	55	12.8	90	7	060		30.28				FM-16	T	30.31
01	1554	7	BKN:07 6 OVC:08 11	1.25	-RA:02 BR:1 |RA |RA	58	14.4	57	13.8	56	13.3	93	8	050		30.29	3	-0.01	30.32	FM-15	0.01	30.32
01	1600	4	5	1.24	||RA	58	14.4	57	13.8	56	13.3	93	8	050		30.30	3	-0.01	30.32	FM-12		
01	1642	7	SCT:04 6 BKN:07 10 OVC:08 24	2.50	-RA:02 BR:1 |RA |RA	58	14.4	56	13.5	55	12.8	90	8	050		30.29				FM-16	0.01	30.32

01	1652	6	SCT:04 7 BKN:07 18 OVC:08 29	2.50	-DZ:01 BR:1 |DZ |DZ	57	14.0	56	13.3	55	13.0	94	8	050		30.29				FM-16		30.32
01	1654	7	SCT:04 7 BKN:07 18 OVC:08 29	2.50	-DZ:01 BR:1 |DZ |DZ	58	14.4	56	13.5	55	12.8	90	7	040		30.29			30.32	FM-15	0.01	30.32
01	1715	7	BKN:07 8 OVC:08 17	2.50	-RA:02 BR:1 |RA |RA	58	14.4	56	13.5	55	12.8	90	7	060		30.29				FM-16	T	30.32
01	1754	7	BKN:07 8 OVC:08 13	2.50	-DZ:01 BR:1 |DZ |DZ	58	14.4	57	13.8	56	13.3	93	13	030		30.30			30.33	FM-15	T	30.33
01	1802	7	BKN:07 8 OVC:08 16	6.00	-DZ:01 BR:1 |DZ |DZ	58	14.4	56	13.5	55	12.8	90	9	040		30.30				FM-16	T	30.33
01	1854	7	SCT:04 7 BKN:07 11 OVC:08 21	5.00	-RA:02 BR:1 |RA |RA	58	14.4	56	13.5	55	12.8	90	10	030		30.31	3	-0.02	30.34	FM-15	0.01	30.34
01	1900	4	8	4.97	||RA	58	14.4	56	13.5	55	12.8	90	10	030		30.32	3	-0.02	30.34	FM-12		
01	1954	7	FEW:02 7 BKN:07 11 OVC:08 30	7.00	-DZ:01 |DZ |DZ	58	14.4	56	13.2	54	12.2	87	10	030		30.31			30.34	FM-15	T	30.34
01	2054	7	FEW:02 8 OVC:08 13	10.00		58	14.4	56	13.2	54	12.2	87	9	040		30.31			30.34	FM-15	T	30.34
01	2152	6	BKN:07 17 OVC:08 33	10.00		57	14.0	55	13.0	54	12.0	88	9	020		30.32				FM-16		30.35
01	2154	7	BKN:07 17 OVC:08 33	10.00		58	14.4	56	13.2	54	12.2	87	11	020		30.32	3	-0.01	30.35	FM-15	T	30.35
01	2200	4	15	9.94		58	14.4	56	13.2	54	12.2	87	11	020		30.33	3	-0.01	30.35	FM-12		
01	2241	7	FEW:02 9 OVC:08 23	7.00	-RA:02 |RA |RA	57	13.9	55	13.0	54	12.2	90	10	030		30.31				FM-16	0.03	30.34
01	2254	7	FEW:02 9 BKN:07 17 OVC:08 23	8.00		57	13.9	55	13.0	54	12.2	90	9	020		30.31			30.33	FM-15	0.03	30.34
01	2352	6	BKN:07 10 BKN:07 14 OVC:08 21	10.00		57	14.0	56	13.3	55	13.0	94	7	030		30.29				FM-16		30.32
01	2354	7	BKN:07 10 BKN:07 14 OVC:08 19	10.00		57	13.9	56	13.3	55	12.8	93	8	040		30.29			30.31	FM-15	0.00	30.32
02	0000	7	SCT:04 8 BKN:07 15 OVC:08 25	10.00		57	13.9	56	13.3	55	12.8	93	8	040		30.28				FM-16		30.31
02	0033	7	BKN:07 9 BKN:07 18 OVC:08 25	10.00		58	14.4	56	13.5	55	12.8	90	8	040		30.27				FM-16		30.30
02	0042	7	BKN:07 11 BKN:07 14 OVC:08 20	10.00		58	14.4	56	13.5	55	12.8	90	9	020		30.28				FM-16		30.31
02	0054	7	BKN:07 10 OVC:08 15	10.00		58	14.4	56	13.5	55	12.8	90	9	020		30.28	6	+0.05	30.30	FM-15	0.00	30.31
02	0100	4	15	9.94		58	14.4	56	13.5	55	12.8	90	9	020		30.29	6	+0.05	30.30	FM-12		
02	0154	7	OVC:08 10	5.00	-RA:02 BR:1 |RA |RA	57	13.9	55	13.0	54	12.2	90	9	040		30.26			30.29	FM-15	T	30.29
02	0209	7	OVC:08 9	2.50	-RA:02 BR:1 |RA |RA	57	13.9	55	13.0	54	12.2	90	9	050		30.26				FM-16	T	30.29
02	0227	7	OVC:08 9	4.00	-RA:02 BR:1 |RA |RA	57	13.9	56	13.3	55	12.8	93	7	040		30.25				FM-16	0.01	30.28
02	0254	7	OVC:08 8	5.00	-RA:02 BR:1 |RA |RA	57	13.9	56	13.3	55	12.8	93	7	040		30.25			30.28	FM-15	0.03	30.28
02	0317	7	OVC:08 10	3.00	-RA:02 BR:1 |RA |RA	57	13.9	56	13.3	55	12.8	93	13	060		30.24				FM-16	0.04	30.27
02	0354	7	OVC:08 11	9.00	-RA:02 |RA |RA	58	14.4	56	13.5	55	12.8	90	9	050		30.24	8	+0.04	30.27	FM-15	0.04	30.27
02	0400	4	15	8.70	||RA	58	14.4	56	13.5	55	12.8	90	9	050		30.25	8	+0.04	30.27	FM-12		
02	0454	7	OVC:08 10	10.00		57	13.9	55	13.0	54	12.2	90	6	360		30.25			30.28	FM-15	0.02	30.28
02	0501	7	OVC:08 6	10.00		57	13.9	55	13.0	54	12.2	90	6	020		30.25				FM-16		30.28
02	0554	7	OVC:08 8	8.00		57	13.9	56	13.3	55	12.8	93	7	010		30.24			30.27	FM-15	0.00	30.27
02	0654	7	OVC:08 7	3.00	BR:1 ||	57	13.9	56	13.3	55	12.8	93	10	040		30.24	8	+0.00	30.27	FM-15	0.00	30.27
02	0700	4	8	2.98		57	13.9	56	13.3	55	12.8	93	10	040		30.25	4	0.00	30.27	FM-12		
02	0734	7	OVC:08 5	1.50	BR:1 ||	57	13.9	56	13.3	55	12.8	93	8	030		30.25				FM-16		30.28
02	0749	7	OVC:08 4	1.50	BR:1 ||	57	14.0	56	13.3	55	13.0	94	11	030		30.25				FM-16		30.28

02	0754	7	OVC:08 4	1.50	-RA:02 BR:1 |RA |RA	57	13.9	56	13.3	55	12.8	93	10	040		30.25			30.27	FM-15	T	30.28
02	0854	7	OVC:08 4	1.25	-DZ:01 BR:1 |DZ |DZ	58	14.4	57	13.8	56	13.3	93	10	010		30.25			30.28	FM-15	0.02	30.28
02	0909	7	OVC:08 5	1.00	-DZ:01 BR:1 |DZ |DZ	57	13.9	56	13.6	56	13.3	96	9	040		30.24				FM-16	T	30.27
02	0954	7	OVC:08 5	1.25	-DZ:01 BR:1 |DZ |DZ	58	14.4	57	13.8	56	13.3	93	9	040		30.23	8	+0.02	30.25	FM-15	0.01	30.26
02	1000	4	5	1.24	||DZ	58	14.4	57	13.8	56	13.3	93	9	040		30.24	8	+0.02	30.25	FM-12		
02	1036	7	OVC:08 5	3.00	BR:1 ||	59	15.0	58	14.4	57	13.9	93	9	070		30.21				FM-16	0.01	30.24
02	1052	6	OVC:08 7	2.50	BR:1 ||	59	15.0	57	13.8	55	13.0	88	10	060		30.20				FM-16		30.23
02	1054	7	OVC:08 7	3.00	BR:1 ||	59	15.0	57	14.1	56	13.3	90	10	060		30.20			30.23	FM-15	0.01	30.23
02	1152	6	OVC:08 6	1.50	-DZ:01 BR:1 |DZ |DZ	59	15.0	58	14.4	57	14.0	94	8	070		30.17				FM-16		30.20
02	1154	7	OVC:08 6	1.50	-DZ:01 BR:1 |DZ |DZ	59	15.0	58	14.4	57	13.9	93	8	060		30.17			30.20	FM-15	T	30.20
02	1250	7	OVC:08 4	1.00	-DZ:01 BR:1 |DZ |DZ	61	16.0	59	14.8	57	14.0	88	9	070		30.13				FM-16	T	30.16
02	1252	6	OVC:08 6	1.25	-DZ:01 BR:1 |DZ |DZ	61	16.0	59	14.8	57	14.0	88	9	070		30.13				FM-16		30.16
02	1254	7	OVC:08 6	1.25	-DZ:01 BR:1 |DZ |DZ	60	15.6	59	14.9	58	14.4	93	9	060		30.13	6	+0.07	30.16	FM-15	T	30.16
02	1300	4	5	1.24	||DZ	60	15.6	59	14.9	58	14.4	93	9	060		30.14	6	+0.07	30.16	FM-12		
02	1307	7	OVC:08 4	1.25	-DZ:01 BR:1 |DZ |DZ	60	15.6	59	14.9	58	14.4	93	7	070		30.13				FM-16	T	30.16
02	1354	7	OVC:08 4	1.25	-DZ:01 BR:1 |DZ |DZ	60	15.6	59	14.9	58	14.4	93	9	070		30.10			30.13	FM-15	0.01	30.13
02	1454	7	OVC:08 4	1.00	-DZ:01 BR:1 |DZ |DZ	60	15.6	59	15.2	59	15.0	96	10	070		30.08			30.11	FM-15	T	30.11
02	1554	7	OVC:08 3	1.25	-DZ:01 BR:1 |DZ |DZ	61	16.1	60	15.5	59	15.0	93	8	050		30.06	6	+0.07	30.09	FM-15	T	30.09
02	1600	4	2	1.24	||DZ	61	16.1	60	15.5	59	15.0	93	8	050		30.07	6	+0.07	30.09	FM-12		
02	1654	7	OVC:08 3	1.75	-DZ:01 BR:1 |DZ |DZ	61	16.1	60	15.8	60	15.6	97	7	050		30.05			30.08	FM-15	T	30.08
02	1754	7	OVC:08 3	1.25	RA:02 BR:1 |RA |RA	62	16.7	61	16.3	61	16.1	96	9	120		30.01			30.04	FM-15	0.05	30.04
02	1842	7	FEW:02 3 OVC:08 5	4.00	-RA:02 BR:1 |RA |RA	63	17.2	62	16.6	61	16.1	93	0	000		30.00				FM-16	0.05	30.03
02	1854	7	SCT:04 5 BKN:07 11 OVC:08 100	5.00	-RA:02 BR:1 |RA |RA	63	17.2	62	16.6	61	16.1	93	7	340		30.00	6	+0.06	30.03	FM-15	0.06	30.03
02	1900	4	5	4.97	||RA	63	17.2	62	16.6	61	16.1	93	7	340		30.01	6	+0.06	30.03	FM-12		
02	1954	7	SCT:04 4 BKN:07 12 OVC:08 100	6.00	BR:1 ||	62	16.7	61	16.0	60	15.6	93	6	340		30.00			30.03	FM-15	0.01	30.03
02	2030	7	BKN:07 8 OVC:08 12	6.00	BR:1 ||	61	16.1	60	15.5	59	15.0	93	5	330		29.99				FM-16		30.02
02	2054	7	BKN:07 8 OVC:08 12	6.00	BR:1 ||	61	16.1	60	15.5	59	15.0	93	7	360		29.98			30.01	FM-15	0.00	30.01
02	2154	7	OVC:08 7	7.00		61	16.1	59	15.2	58	14.4	90	6	350		29.97	8	+0.03	30.00	FM-15	0.00	30.00
02	2200	4	8	6.84		61	16.1	59	15.2	58	14.4	90	6	350		29.98	8	+0.03	30.00	FM-12		
02	2254	7	OVC:08 6	7.00		61	16.1	60	15.5	59	15.0	93	5	350		29.97			30.00	FM-15	0.00	30.00
02	2316	7	OVC:08 4	7.00		61	16.1	60	15.5	59	15.0	93	5	010		29.97				FM-16		30.00
02	2352	6	OVC:08 3	2.50	RA:02 BR:1 |RA |RA	61	16.0	60	15.5	59	15.0	94	0	000		29.97				FM-16		30.00
02	2354	7	OVC:08 3	2.50	RA:02 BR:1 |RA |RA	61	16.1	60	15.5	59	15.0	93	0	000		29.96			29.99	FM-15	0.03	29.99
03	0006	7	OVC:08 3	3.00	RA:02 BR:1 |RA |RA	60	15.6	58	14.6	57	13.9	90	8	030		29.96				FM-16	0.04	29.99
03	0054	7	OVC:08 4	6.00	RA:02 BR:1 |RA |RA	58	14.4	57	13.8	56	13.3	93	6	010		29.96	8	+0.02	29.98	FM-15	0.13	29.99
03	0100	4	5	5.59	||RA	58	14.4	57	13.8	56	13.3	93	6	010		29.97	8	+0.02	29.98	FM-12		
03	0123	7	BKN:07 6 OVC:08 11	6.00	-RA:02 BR:1 |RA |RA	58	14.4	57	13.8	56	13.3	93	6	010		29.95				FM-16	0.04	29.98
03	0154	7	OVC:08 8	10.00	-RA:02 |RA |RA	57	13.9	56	13.3	55	12.8	93	6	010		29.94			29.97	FM-15	0.05	29.97
03	0254	7	OVC:08 5	10.00	-RA:02 |RA |RA	56	13.3	55	12.7	54	12.2	93	8	350		29.95			29.97	FM-15	0.02	29.98
03	0354	7	BKN:07 5 OVC:08 10	3.00	-RA:02 BR:1 |RA |RA	55	12.8	54	12.2	53	11.7	93	7	360		29.95	5	+0.01	29.98	FM-15	0.01	29.98
03	0400	4	5	2.98	||RA	55	12.8	54	12.2	53	11.7	93	7	360		29.96	5	+0.01	29.98	FM-12		
03	0405	7	OVC:08 3	5.00	BR:1 ||	55	12.8	54	12.2	53	11.7	93	9	340		29.95				FM-16	0.01	29.98
03	0454	7	BKN:07 3 OVC:08 80	6.00	BR:1 ||	54	12.2	53	11.9	53	11.7	97	7	340		29.96			29.98	FM-15	T	29.99
03	0526	7	OVC:08 5	10.00		54	12.2	53	11.6	52	11.1	93	7	350		29.96				FM-16		29.99
03	0554	7	OVC:08 6	9.00		54	12.2	53	11.6	52	11.1	93	8	350		29.97			29.99	FM-15	0.00	30.00
03	0654	7	OVC:08 5	3.00	BR:1 ||	54	12.2	53	11.6	52	11.1	93	5	350		29.98	3	-0.03	30.01	FM-15	0.00	30.01
03	0700	4	5	2.98		54	12.2	53	11.6	52	11.1	93	5	350		29.99	3	-0.03	30.01	FM-12		
03	0725	7	OVC:08 5	1.75	BR:1 ||	55	12.8	53	11.9	52	11.1	90	6	340		29.99				FM-16		30.02
03	0752	6	OVC:08 4	1.25	BR:1 ||	55	13.0	54	12.5	54	12.0	94	3	030		30.00				FM-16		30.03

03	0754	7	OVC:08 4	1.50	BR:1 ||	55	12.8	54	12.2	53	11.7	93	3	010		30.00			30.03	FM-15	0.00	30.03
03	0811	7	OVC:08 4	2.50	BR:1 ||	55	12.8	54	12.2	53	11.7	93	3	340		30.00				FM-16		30.03
03	0822	7	OVC:08 5	4.00	BR:1 ||	56	13.3	54	12.4	53	11.7	90	3	VRB		30.01				FM-16		30.04
03	0830	7	OVC:08 5	2.50	BR:1 ||	56	13.3	54	12.4	53	11.7	90	3	320		30.01				FM-16		30.04
03	0854	7	OVC:08 5	2.50	BR:1 ||	56	13.3	54	12.4	53	11.7	90	5	360		30.01			30.04	FM-15	0.00	30.04
03	0952	6	BKN:07 7 OVC:08 12	7.00		57	14.0	55	13.0	54	12.0	88	0	000		30.02				FM-16		30.05
03	0954	7	BKN:07 7 OVC:08 12	7.00		58	14.4	56	13.5	55	12.8	90	0	000		30.02	1	-0.04	30.05	FM-15	0.00	30.05
03	1000	4	8	6.84		58	14.4	56	13.5	55	12.8	90	0	000		30.03	1	-0.04	30.05	FM-12		
03	1054	7	OVC:08 8	10.00		59	15.0	57	13.8	55	12.8	87	5	050		30.04			30.06	FM-15	0.00	30.07
03	1154	7	OVC:08 10	10.00		61	16.1	58	14.2	55	12.8	81	5	350		30.03			30.06	FM-15	0.00	30.06
03	1254	7	BKN:07 10 OVC:08 22	10.00		63	17.2	59	15.0	56	13.3	78	6	320		30.01	8	+0.01	30.03	FM-15	0.00	30.04
03	1300	4	15	9.94		63	17.2	59	15.0	56	13.3	78	6	320		30.02	8	+0.01	30.03	FM-12		
03	1354	7	FEW:02 10 OVC:08 14	10.00		63	17.2	59	15.0	56	13.3	78	5	290		30.00			30.03	FM-15	0.00	30.03
03	1454	7	FEW:02 10 OVC:08 14	10.00		63	17.2	59	15.0	56	13.3	78	8	320		30.02			30.05	FM-15	0.00	30.05
03	1554	7	FEW:02 10 OVC:08 14	10.00		62	16.7	59	14.8	56	13.3	80	6	310		30.03	3	-0.02	30.06	FM-15	0.00	30.06
03	1600	4	15	9.94		62	16.7	59	14.8	56	13.3	80	6	310		30.04	3	-0.02	30.06	FM-12		
03	1654	7	FEW:02 10 OVC:08 14	10.00		62	16.7	59	14.8	56	13.3	80	3	030		30.04			30.06	FM-15	0.00	30.07
03	1754	7	FEW:02 10 OVC:08 13	10.00		62	16.7	59	14.8	56	13.3	80	8	010		30.05			30.07	FM-15	0.00	30.08
03	1854	7	FEW:02 10 OVC:08 13	10.00		61	16.1	58	14.2	55	12.8	81	7	360		30.07	3	-0.04	30.10	FM-15	0.00	30.10
03	1900	4	15	9.94		61	16.1	58	14.2	55	12.8	81	7	360		30.08	3	-0.04	30.10	FM-12		
03	1950	7	SCT:04 13 BKN:07 17 OVC:08 100	10.00		61	16.0	58	14.2	55	13.0	83	3	VRB		30.07				FM-16		30.10
03	1954	7	FEW:02 13 BKN:07 17 OVC:08 100	10.00		61	16.1	58	14.5	56	13.3	84	5	060		30.07			30.10	FM-15	0.00	30.10
03	2054	7	FEW:02 12 OVC:08 17	10.00		61	16.1	58	14.5	56	13.3	84	5	080		30.08			30.11	FM-15	0.00	30.11
03	2152	6	OVC:08 13	10.00		61	16.0	58	14.2	55	13.0	83	5	070		30.07				FM-16		30.10
03	2154	7	OVC:08 13	10.00		61	16.1	58	14.5	56	13.3	84	3	070		30.07	0	-0.00	30.10	FM-15	0.00	30.10
03	2200	4	15	9.94		61	16.1	58	14.5	56	13.3	84	3	070		30.08	9	0.00	30.10	FM-12		
03	2254	7	BKN:07 14 BKN:07 24	10.00		61	16.1	58	14.5	56	13.3	84	5	140		30.06			30.09	FM-15	0.00	30.09
03	2354	7	SCT:04 14 OVC:08 25	10.00		60	15.6	58	14.3	56	13.3	86	7	140		30.05			30.07	FM-15	0.00	30.08
04	0054	7	FEW:02 14 OVC:08 23	10.00		61	16.1	58	14.5	56	13.3	84	8	180		30.04	6	+0.04	30.06	FM-15	0.00	30.07
04	0100	4	15	9.94		61	16.1	58	14.5	56	13.3	84	8	180		30.05	6	+0.04	30.06	FM-12		
04	0154	7	OVC:08 21	10.00		60	15.6	57	14.0	55	12.8	84	8	170		30.03			30.05	FM-15	0.00	30.06
04	0254	7	OVC:08 21	10.00		60	15.6	57	14.0	55	12.8	84	7	200		30.02			30.05	FM-15	0.00	30.05
04	0337	7	BKN:07 10 OVC:08 18	10.00		60	15.6	57	14.0	55	12.8	84	6	190		30.03				FM-16		30.06
04	0352	6	OVC:08 8	10.00		61	16.0	58	14.2	55	13.0	83	7	190		30.02				FM-16		30.05
04	0354	7	BKN:07 8 OVC:08 11	10.00		60	15.6	58	14.3	56	13.3	86	7	200		30.03	5	+0.01	30.05	FM-15	0.00	30.06
04	0400	4	8	9.94		60	15.6	58	14.3	56	13.3	86	7	200		30.04	5	+0.01	30.05	FM-12		
04	0454	7	BKN:07 8 OVC:08 11	10.00		60	15.6	58	14.6	57	13.9	90	7	200		30.02			30.05	FM-15	0.00	30.05
04	0523	7	SCT:04 8 OVC:08 32	8.00		60	15.6	58	14.6	57	13.9	90	7	190		30.01				FM-16		30.04
04	0554	7	OVC:08 31	10.00		60	15.6	58	14.6	57	13.9	90	7	180		30.01			30.04	FM-15	0.00	30.04

04	0647	7	FEW:02 8 SCT:04 16 OVC:08 32	10.00		61	16.1	59	14.8	57	13.9	87	9	190		30.02				FM-16		30.05
04	0652	6	FEW:02 8 BKN:07 16 OVC:08 32	10.00		61	16.0	59	14.8	57	14.0	88	8	200		30.02				FM-16		30.05
04	0654	7	FEW:02 8 BKN:07 16 OVC:08 32	10.00		61	16.1	59	14.8	57	13.9	87	7	190		30.02	5	+0.01	30.05	FM-15	0.00	30.05
04	0700	4	8	9.94		61	16.1	59	14.8	57	13.9	87	7	190		30.03	5	+0.01	30.05	FM-12		
04	0735	7	FEW:02 9 SCT:04 18 OVC:08 30	10.00		62	16.7	60	15.4	58	14.4	86	9	170		30.01				FM-16		30.04
04	0752	6	BKN:07 9 BKN:07 18 BKN:07 30	10.00		63	17.0	60	15.3	57	14.0	83	9	180		30.00				FM-16		30.03
04	0754	7	BKN:07 9 BKN:07 18 BKN:07 30	10.00		63	17.2	60	15.6	58	14.4	84	9	180		30.00			30.03	FM-15	0.00	30.03
04	0830	7	BKN:07 13 BKN:07 19 BKN:07 32	10.00		65	18.3	61	16.4	59	15.0	81	9	200		30.01				FM-16		30.04
04	0854	7	BKN:07 11 OVC:08 19	10.00		65	18.3	61	16.4	59	15.0	81	9	200		30.01			30.03	FM-15	0.00	30.04
04	0954	7	BKN:07 13 BKN:07 200	10.00		67	19.4	63	17.1	60	15.6	79	15	220		29.98	8	+0.04	30.01	FM-15	0.00	30.01
04	1000	4	15	9.94		67	19.4	63	17.1	60	15.6	79	15	220		29.99	8	+0.04	30.01	FM-12		
04	1030	7	FEW:02 14 BKN:07 20 BKN:07 200	10.00		71	21.7	65	18.3	61	16.1	71	14	190		29.96				FM-16		29.99
04	1054	7	FEW:02 14 BKN:07 22 BKN:07 200	10.00		71	21.7	65	18.3	61	16.1	71	13	220	23	29.96			29.98	FM-15	0.00	29.99
04	1154	7	BKN:07 23 BKN:07 200	10.00		72	22.2	65	18.5	61	16.1	68	15	220		29.92			29.95	FM-15	0.00	29.95
04	1254	7	BKN:07 22 OVC:08 200	10.00		72	22.2	66	19.1	63	17.2	73	15	190		29.88	8	+0.09	29.91	FM-15	0.00	29.91
04	1300	4	26	9.94		72	22.2	66	19.1	63	17.2	73	15	190		29.89	8	+0.09	29.91	FM-12		
04	1354	7	SCT:04 20 BKN:07 26 OVC:08 200	10.00		73	22.8	67	19.6	64	17.8	74	17	200	24	29.87			29.90	FM-15	0.00	29.90
04	1454	7	SCT:04 17 BKN:07 24 BKN:07 200	10.00		71	21.7	66	18.9	63	17.2	76	15	210	24	29.87			29.90	FM-15	0.00	29.90
04	1537	7	FEW:02 17 SCT:04 28 BKN:07 160	10.00		71	21.7	67	19.2	64	17.8	79	15	220		29.87				FM-16		29.90
04	1554	7	FEW:02 15 SCT:04 29 BKN:07 130	10.00		71	21.7	67	19.2	64	17.8	79	13	210		29.86	6	+0.02	29.89	FM-15	0.00	29.89
04	1600	4	15	9.94		71	21.7	67	19.2	64	17.8	79	13	210		29.87	6	+0.02	29.89	FM-12		
04	1654	7	SCT:04 14 BKN:07 130 BKN:07 220	10.00		70	21.1	66	19.0	64	17.8	82	13	210		29.87			29.89	FM-15	0.00	29.90
04	1754	7	FEW:02 18 SCT:04 40 BKN:07 130	10.00		70	21.1	66	19.0	64	17.8	82	10	210		29.88			29.91	FM-15	0.00	29.91
04	1854	7	FEW:02 17 BKN:07 41 OVC:08 130	10.00		70	21.1	66	19.0	64	17.8	82	14	220		29.89	3	-0.03	29.92	FM-15	0.00	29.92
04	1900	4	15	9.94		70	21.1	66	19.0	64	17.8	82	14	220		29.90	3	-0.03	29.92	FM-12		
04	1954	7	FEW:02 21 SCT:04 70 BKN:07 130	10.00		70	21.1	67	19.4	65	18.3	84	11	230		29.89			29.92	FM-15	0.00	29.92

04	2054	7	SCT:04 70 BKN:07 120	10.00		71	21.7	67	19.6	65	18.3	81	14	VRB		29.90			29.92	FM-15	0.00	29.93
04	2154	7	BKN:07 110	10.00		71	21.7	67	19.6	65	18.3	81	11	270		29.91	3	-0.01	29.93	FM-15	0.00	29.94
04	2200	4		9.94		71	21.7	67	19.6	65	18.3	81	11	270		29.92	3	-0.01	29.93	FM-12		
04	2254	7	FEW:02 120	10.00		70	21.1	67	19.4	65	18.3	84	8	290		29.93			29.96	FM-15	0.00	29.96
04	2354	7	FEW:02 70	8.00		69	20.6	66	19.2	65	18.3	87	11	290		29.94			29.97	FM-15	0.00	29.97
05	0054	7	FEW:02 70	10.00		68	20.0	64	17.6	61	16.1	78	14	320	22	29.94	1	-0.04	29.97	FM-15	0.00	29.97
05	0100	4	74	9.94		68	20.0	64	17.6	61	16.1	78	14	320		29.95	1	-0.04	29.97	FM-12		
05	0154	7	CLR:00	10.00		65	18.3	60	15.5	56	13.3	73	13	320		29.97			29.99	FM-15	0.00	30.00
05	0254	7	FEW:02 50	10.00		63	17.2	58	14.7	55	12.8	75	11	330		30.00			30.03	FM-15	0.00	30.03
05	0354	7	FEW:02 55	10.00		62	16.7	57	13.9	53	11.7	73	10	340		30.03	3	-0.09	30.06	FM-15	0.00	30.06
05	0400	4	57	9.94		62	16.7	57	13.9	53	11.7	73	10	340		30.04	3	-0.09	30.06	FM-12		
05	0454	7	SCT:04 26 BKN:07 55	10.00		60	15.6	56	13.1	52	11.1	75	11	340		30.07			30.10	FM-15	0.00	30.10
05	0510	7	BKN:07 26 BKN:07 50	10.00		60	15.6	56	13.1	52	11.1	75	8	350		30.08				FM-16		30.11
05	0552	6	SCT:04 24 SCT:04 50	10.00		59	15.0	54	12.3	50	10.0	72	11	340		30.11				FM-16		30.14
05	0554	7	SCT:04 24 SCT:04 50	10.00		58	14.4	54	12.1	50	10.0	75	10	360		30.11			30.14	FM-15	0.00	30.14
05	0654	7	FEW:02 22 FEW:02 50	10.00		58	14.4	52	11.3	47	8.3	67	15	020		30.15	3	-0.12	30.17	FM-15	0.00	30.18
05	0700	4	26	9.94		58	14.4	52	11.3	47	8.3	67	15	020		30.16	3	-0.12	30.17	FM-12		
05	0754	7	FEW:02 25 FEW:02 50	10.00		58	14.4	50	10.3	43	6.1	58	15	020		30.18			30.20	FM-15	0.00	30.21
05	0854	7	FEW:02 28 FEW:02 50	10.00		58	14.4	51	10.8	45	7.2	62	15	030		30.19			30.22	FM-15	0.00	30.22
05	0954	7	SCT:04 26	10.00		59	15.0	52	11.0	45	7.2	60	16	010		30.20	1	-0.06	30.23	FM-15	0.00	30.23
05	1000	4	26	9.94		59	15.0	52	11.0	45	7.2	60	16	010		30.21	1	-0.06	30.23	FM-12		
05	1054	7	SCT:04 27	10.00		59	15.0	52	11.0	45	7.2	60	14	030		30.20			30.22	FM-15	0.00	30.23
05	1154	7	FEW:02 28	10.00		58	14.4	51	10.5	44	6.7	60	11	040	22	30.19			30.21	FM-15	0.00	30.22
05	1254	7	FEW:02 30	10.00		58	14.4	51	10.8	45	7.2	62	11	050		30.17	8	+0.03	30.20	FM-15	0.00	30.20
05	1300	4	26	9.94		58	14.4	51	10.8	45	7.2	62	11	050		30.18	8	+0.03	30.20	FM-12		
05	1354	7	FEW:02 33 SCT:04 230	10.00		58	14.4	52	11.0	46	7.8	65	13	100		30.16			30.19	FM-15	0.00	30.19
05	1454	7	FEW:02 35 BKN:07 230	10.00		57	13.9	51	10.5	45	7.2	64	11	100		30.16			30.18	FM-15	0.00	30.19
05	1554	7	FEW:02 35 BKN:07 230	10.00		57	13.9	50	10.3	44	6.7	62	10	090		30.15	6	+0.02	30.18	FM-15	0.00	30.18
05	1600	4	41	9.94		57	13.9	50	10.3	44	6.7	62	10	090		30.16	6	+0.02	30.18	FM-12		
05	1654	7	BKN:07 230	10.00		55	12.8	50	9.7	44	6.7	67	7	090		30.16			30.19	FM-15	0.00	30.19
05	1754	7	FEW:02 110 BKN:07 230	9.00		54	12.2	49	9.2	43	6.1	67	7	100		30.17			30.20	FM-15	0.00	30.20
05	1854	7	FEW:02 110 SCT:04 230	10.00		54	12.2	49	9.5	44	6.7	69	8	110		30.18	1	-0.03	30.20	FM-15	0.00	30.21
05	1900	4		9.94		54	12.2	49	9.5	44	6.7	69	8	110		30.19	1	-0.03	30.20	FM-12		
05	1954	7	FEW:02 110 FEW:02 200	10.00		54	12.2	49	9.5	44	6.7	69	9	100		30.19			30.21	FM-15	0.00	30.22
05	2054	7	FEW:02 200	10.00		55	12.8	50	9.7	44	6.7	67	7	080		30.20			30.23	FM-15	0.00	30.23
05	2154	7	FEW:02 250	10.00		54	12.2	49	9.5	44	6.7	69	6	080		30.20	1	-0.03	30.23	FM-15	0.00	30.23
05	2200	4		9.94		54	12.2	49	9.5	44	6.7	69	6	080		30.21	1	-0.03	30.23	FM-12		
05	2254	7	CLR:00	10.00		53	11.7	49	9.5	45	7.2	74	5	350		30.21			30.23	FM-15	0.00	30.24
05	2354	7	CLR:00	10.00		53	11.7	49	9.5	45	7.2	74	6	340		30.19			30.22	FM-15	0.00	30.22

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Current Location: Elev: 12 ft. Lat: 42.3606° N Lon: -71.0097° W
Station: **BOSTON, MA US 14739**

Local Climatological Data
Hourly Precipitation
September 2018

Generated on 10/11/2018

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Date	For Hour (LST) Ending at																							Date
	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	NOON	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	MID	
01																									01
02																									02
03																									03
04																									04
05																									05
06																T	0.01	0.02	T						06
07													T												07
08		T	T																						08
09																									09
10													T	T		0.01	0.01	0.10	0.10	0.07	0.13	0.14	0.09	0.11	10
11	0.14	0.14	0.07	0.07	0.10	0.01																			11
12		T	T		T	0.01						0.01	0.01	0.08	0.09	T						0.05s	0.01		12
13	0.02	0.22	0.05	0.07	0.08	T	M																		13
14																									14
15					T								M												15
16													M												16
17																								T	17
18	T	0.03	0.01	M	0.12	T	0.02	T	T	0.05s	0.63	0.08	0.12	0.03	0.03										18
19				T					T		T	T							M			M			19
20	M			M							T														20
21																									21
22			0.03	T																					22
23																									23
24																									24
25									T	0.01	T	0.02	0.06	0.04	0.14	0.11	0.04	0.05	0.02	0.01	0.05	0.07	0.61	0.01	25
26							T																0.08	0.20	26
27	0.05	T																							27
28	T				T	0.01	0.13s	0.10	0.02	T	0.08	T	T	0.01	T	T									28
29																									29
30																									30

Maximum Short Duration Precipitation

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (inches)	0.25	0.30	0.40	0.45	0.52	0.57	0.63	0.69	0.71	0.74	0.81	0.85
Ending Date Time (yyyy-mm-dd hh:mi)	2018-09-18 10:10	2018-09-18 10:14	2018-09-18 10:20	2018-09-18 10:24	2018-09-25 22:34	2018-09-25 22:45	2018-09-18 10:58	2018-09-18 11:17	2018-09-18 11:17	2018-09-18 11:17	2018-09-18 12:33	2018-09-18 12:39

Hourly, daily, and monthly totals on the Daily Summary page and the Hourly Precipitation Table are shown as reported by the instrumentation at the site. However, NWS does not edit hourly values for its ASOS sites, but may edit the daily and monthly totals for selected sites which will be reflected on the Daily Summary page.

T = Trace
s = Suspect
* = Erroneous
blank = No precipitation observed
M = Missing

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Current Location: Elev: 12 ft. Lat: 42.3606° N Lon: -71.0097° W
Station: **BOSTON, MA US 14739**

Local Climatological Data
Hourly Precipitation
October 2018

Generated on 10/11/2018

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Date	For Hour (LST) Ending at																						Date
	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	NOON	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	MID	
01															T	0.01	0.01	T	0.01	T	T	T	0.03		01
02		T	0.03	0.04	0.02			T	0.02	0.01	0.01	T	T	0.01	T	T	T	0.05	0.06	0.01				0.03	02
03	0.13	0.05	0.02	0.01	T																				03
04																									04
05																									05
06																									06
07															T	0.06		0.01	0.02	0.01	T				07
08													T					M					M	M	08

Maximum Short Duration Precipitation

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (inches)												
Ending Date Time (yyyy-mm-dd hh:mi)												

Hourly, daily, and monthly totals on the Daily Summary page and the Hourly Precipitation Table are shown as reported by the instrumentation at the site. However, NWS does not edit hourly values for its ASOS sites, but may edit the daily and monthly totals for selected sites which will be reflected on the Daily Summary page.

T = Trace
s = Suspect
* = Erroneous
blank = No precipitation observed
M = Missing

Enclosure 3: Attachment H – Applicant Redline (10/24/2018) to Draft Proposed Non-Major CPA (03/30/2017)

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
Southeast Regional Office • 20 Riverside Drive, Lakeville MA 02347 • 508-946-2700

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

March 30, 2017

Mr. Thomas Wooden Jr.
Vice President, Field Operations
Algonquin Gas Transmission, LLC.
P.O. Box 1642
Houston, TX 77251-1642

RE: **Weymouth**
Transmittal No.: X266786
Application No.: SE-15-027
Class: SM-25
FMF No.: 571926
AIR QUALITY PROPOSED PLAN APPROVAL

Dear Mr. Wooden:

The Massachusetts Department of Environmental Protection ("MassDEP"), Bureau of Air and Waste, has reviewed your non-Major Comprehensive Plan Application ("Application") listed above. This Application concerns the proposed construction of a natural gas fired turbine at your proposed gas pipeline compressor station located at 50 Bridge Street in Weymouth, Massachusetts ("Facility"). The Application bears the seal and signature of ~~David Cotter~~Lynne Santos Massachusetts Registered Professional Engineer Number ~~4906~~847225.

This Application was submitted in accordance with 310 CMR 7.02 Plan Approval and Emission Limitations as contained in 310 CMR 7.00 "Air Pollution Control" regulations adopted by MassDEP pursuant to the authority granted by Massachusetts General Laws, Chapter 111, Section 142 A-N, Chapter 21C, Section 4 and 6, and Chapter 21E, Section 6. MassDEP's review of your Application has been limited to air pollution control regulation compliance and does not relieve you of the obligation to comply with any other regulatory requirements.

In response to a public petition, accompanied by over one hundred (100) signatures, this Proposed Plan Approval has been made subject to a 30-day public comment period. All comments received will be considered and addressed, as appropriate, before taking a final action on the Plan Application.

MassDEP has determined that the Application is administratively and technically complete and that the Application is in conformance with the Air Pollution Control regulations and current air pollution control engineering practice, and hereby **Proposes** to grant this **Plan Approval** for said Application, as submitted, subject to the conditions listed below.

Sound Impacts and Mitigation

Operation of the Facility will create several sources of sound, which will be mitigated as follows: 1. Insulated / acoustically treated building housing the turbine and compressor, 2. use of a sound suppressant muffler on the turbine exhaust, 3. acoustical pipe insulation for outdoor above ground piping, 4. a silencer for the turbine air intake system, 5. low-noise lube oil coolers, 6. a low-noise gas cooler, and 7. a blowdown silencer.

The Facility is designed to meet the MassDEP Noise Policy which limits the maximum sound impacts attributable to a noise source to an increase in the broadband sound level of no more than 10 dB(A) above ambient ~~Federal Energy Regulatory Commission ("FERC") standards for air and noise quality, which limits noise attributable to any new compressor station to an average day-night sound level of 55 decibels A-weighted ("dB(A)") at any pre-existing noise sensitive area ("NSA")[5].~~

A sound analysis[6], which was included with the Air Plan Application as updated, evaluated sound impacts at ~~nine~~ seven ~~NSA~~ receptor locations in the vicinity of the Station[7] ~~s~~ as follows:

- Receptor A/Location M1: King's Cove Property Line; represents sound levels at the closest property line immediately east of the Station, approximately 90 feet east of the center of the compressor building. This location also represents existing sound levels along the walking path that goes through the public park located in the Fore River Basin south of the MWRA pumping station within the King's Cove conservation area.
- Receptor B/Location M2: Bridge Street; represents sound levels at the nearest residences to the southeast of the Station, approximately 840 feet from the center of the compressor building.
- Receptor C/Location M3: Monatiquot Street; represents sound levels at the nearest residences to the south of the Station, approximately 1,300 feet from the center of the compressor building. This location is just within the Fore River Energy Center fence line near the intersection of Monatiquot Street and Bluff Road.
- Receptor D/Location M4: King's Cove Beach Road; represents sound levels at the nearest residences to the east of the Station along King's Cove Beach Road, approximately 1,530 feet from the center of the compressor building.
- Receptor E/Location M5: City of Quincy Park; represents sound levels at the nearest residences to the west of the Station in Quincy along Washington Street, located approximately 2,850 feet from the center of the compressor building.

~~[5] 18 CFR 380.12(k)(4)(v)(A). A NSA as defined therein includes schools, hospitals, and residences.~~
[6] ~~Hoover & Keith, Inc., *Weymouth Compressor Station Results of Additional Ambient Sound Survey and Updated Acoustical Analysis of a New Natural Gas Compressor Station Associated with the Proposed Atlantic Bridge Project*, dated January 11, 2017~~Epsilon Associates, Inc. "*Sound Level Impact Assessment Report, Weymouth Compressor Station, Atlantic Bridge Project, Weymouth, Massachusetts*," dated October 15, 2018.
[7] Six of the seven modeling receptors were selected based on the ambient measurement locations. The seventh receptor (G) was included to represent the closest residences to the north of the Station.

- Receptor F/Location M6: O'Brien Towers; represents sound levels at the nearest group of residences to the north of the Station. The location is in Quincy on the south lawn of the O'Brien Towers south of Bicknell Street, located approximately 1,740 feet from the center of the compressor building.
- Receptor G: Germantown; represents sound levels at the nearest group of residences to the north of the Station in the Germantown neighborhood of Quincy. The location is located approximately 1,420 feet from the center of the compressor building.
- ~~NSA #1; Residences located on the North Side of Bridge Street, in Weymouth, approximately 610 feet south-southeast of the Station site "acoustic center" (i.e., anticipated location of Compressor Building);~~
- ~~NSA #2; Residences at the end of Saint German St. (area of Germantown Point; Town of Quincy), approximately 1,370 feet north of the Station site center;~~
- ~~NSA #3; Residences located along Kings Cove Beach Road (near Hunt Hills Point, Weymouth), approximately 1,560 feet east of the Station site center;~~
- ~~NSA #4; Residences located near the intersection of Monatiquot Street and Vaness Road (Weymouth), approximately 900 feet south of the Station site center;~~
- ~~NSA #5; Residences located along Kings Cove Way (Weymouth), approximately 1,030 feet southeast (SE) of the Station site center;~~
- ~~NSA #6; Residences located in the area of Roslind Road and Evans Road (Weymouth), approximately 2,300 feet SE of the Station site center;~~
- ~~NSA #7; Residences located in the area of Weybosset Street and Fore River Ave. (Weymouth), approximately 1,970 feet east-northeast (ENE) of the Station site center;~~
- ~~NSA #8; Residences located along Dee Road (Quincy), approximately 2,400 feet west of the Station site center; and~~
- ~~NSA #9; Johnson School (Pearl Street, Weymouth), located approximately 4,200 feet east-southeast (ESE) of the Station site center.~~

~~MassDEP's Noise Policy limits the maximum sound impacts attributable to a noise source to an increase in the broadband sound level of no more than 10 dB(A) above ambient.~~ The sound impact analysis indicates that the Facility will not cause an increase in sound in excess of the sound impacts allowed by MassDEP's Noise Policy. The results of the sound impact analysis are as follows:

Table 2

Identified Receptor	Distance & Direction of Receptor/NSA	Measured Ambient Nighttime L90 (dBA)	~~Calculated~~Modeled Sound Level of Station [dB(A)]	~~Calculated~~ Modeled Station Level + Lowest Ambient Level [dB(A)]	Increase above Lowest Ambient Level [dB(A)]
~~NSA-1~~A	~~610~~ 90 feet (~~SSE~~east)	~~44.8~~40	~~42.6~~47	~~46.9~~47	~~2.1~~7 [1]

Table 2					
Identified Receptor	Distance & Direction of Receptor/NSA	Measured Ambient Nighttime L90 (dBA)	~~Calculated~~Modeled Sound Level of Station [dB(A)]	~~Calculated~~ Modeled Station Level + Lowest Ambient Level [dB(A)]	Increase above Lowest Ambient Level [dB(A)]
~~NSA 2~~B	~~1,370~~840 feet (~~north~~SE)	~~46.8~~36	~~35.7~~44	~~47.1~~44	~~0.3~~8
~~NSA 3~~C	~~1,560~~1,300 feet (~~east~~south)	~~44.0~~45	~~34.4~~40	~~44.4~~46	~~0.4~~1
~~NSA 4~~D	~~900~~ 1,530 feet (~~south~~east)	~~48.5~~37	~~38.9~~31	~~48.9~~38	~~0.4~~1
~~NSA 5~~E	~~1,030~~ 2,850 feet (~~SE~~west)	~~41.3~~34	~~37.5~~35	~~42.8~~37	~~1.5~~3
~~NSA 6~~F	~~2,300~~1,740 feet (~~SE~~north)	~~41.4~~41	~~29.3~~36	~~41.7~~42	~~0.3~~1
~~NSA 7~~G	~~1,970~~1,420 feet (~~ENE~~north)	~~39.3~~41 [1,2]	~~31.8~~38	~~40.0~~43	~~0.7~~2
~~NSA 8~~	~~2,400 feet (west)~~	~~44.5~~	~~28.9~~	~~44.6~~	~~0.1~~
~~NSA 9~~	~~4,200 feet (ESE)~~	~~41.0~~	~~22.7~~	~~41.1~~	~~0.1~~

Table 2 Notes:
1. Receptor A is the closest station property line shared with the King's Cove Parcel. Though the increase above the nighttime L90 is modeled to be 7 db(A), the King's Cove Parcel is not occupied at night. The increase above the daytime L90 is modeled to be 5 dB(A).
2. Background sound level at receptor G is estimated to be equal to the level at receptor F due to their proximity.

Table 2 Key:

~~ENE = east northeast~~
~~ESE = east southeast~~
SE = southeast
~~SSE = south southeast~~
dB(A) = decibels, A weighted
~~NSA = noise sensitive area~~

In addition, the sound impact analysis indicates the sound contribution at the closest station property line (Receptor A), which is the east station property line shared with the King's Cove Parcel, will not exceed the MassDEP Noise Policy.

MassDEP's Noise Policy also prohibits a "pure tone" condition, which is defined as when any octave band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by 3 decibels or more. A review of the sound analysis and associated supplemental forms submitted with the Application indicate operation of the Facility will not create a pure tone condition.

Accordingly, the predicted sound impacts generated by the Facility will meet the requirements of MassDEP's Noise Policy. A post-construction compliance demonstration for sound impacts is required herein.

C. EMISSIONS MODELING

An air dispersion modeling analysis[8] was conducted to demonstrate that the project's ambient air impacts, combined with the pre-existing background levels, will not cause or contribute to a violation of the National Ambient Air Quality Standards ("NAAQS"). The primary standards are health based standards established under the United States Clean Air Act ("CAA") that are designed to preserve public health and protect sensitive subpopulations, which include people with diseases (e.g. asthma, cardiovascular disease), children, and the elderly with an adequate margin of safety. The Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings

EPA has established Significant Impact Levels ("SILs"), which are numerical values that are used to evaluate the impact that a proposed source may have on the NAAQS (72 CFR 54.138). The SIL is the level of ambient impact below which the EPA considers a source to have an insignificant impact on air quality (72 CFR 54.130). The SILS are a small fraction of the NAAQS and ambient impacts below the SIL are commonly referred to as "de minimis." If the modeling shows that: (1) the predicted impact of a pollutant is less than the SIL, and (2) the difference between the background ambient air concentration and the NAAQS for that pollutant is greater than the SIL, the predicted impact of that pollutant is deemed insignificant. In these circumstances, MassDEP follows EPA Guidance and concludes that the emissions of that pollutant do not cause or contribute to a violation of the NAAQS without requiring cumulative impact modeling.

Table 3

Comparison of Maximum Predicted Impacts with Significant Impact Levels

Pollutant	Averaging Period	Max Impact ($\mu g/m^3$)	SIL ($\mu g/m^3$)	Below SIL
NO_2	1-Hour	**14.4**	7.5	**no**
	Annual	**2.0**	1	**no**
SO_2	1-Hour	6.5	7.8	yes
	3-Hour	6.3	25	yes
	24-Hour	**5.5**	5	**no**
	Annual	0.8	1	yes
PM_{10}	24-Hour	2.6	5	yes
$PM_{2.5}$	24-Hour	**2.3**	1.2	**no**
	Annual	**0.35**	0.3	**no**
CO	1-Hour	122.8	2,000	yes

[8] Trinity Consultants, *Updated Air Dispersion Modeling Report, Algonquin Gas Transmission, LLC., Weymouth Compressor Station*, ~~dated September 2016~~ revised May 2018.

	8-Hour	101.0	500	yes

Table 3 Key:

CO = Carbon Monoxide
NO_2 = Nitrogen Dioxide
PM_{10} = Particulate Matter ≤ 10 microns in diameter
$PM_{2.5}$ = Particulate Matter ≤ 2.5 microns in diameter
SO_2 = Sulfur Dioxide
SIL = significant impact level
µg/m³ = micrograms per cubic meter

Since the predicted impacts of SO_2 (1-hour, 3-hour, and annual averaging periods), PM_{10}, and CO are below the SIL, no additional modeling was performed. The predicted impacts of NO_2, $PM_{2.5}$, and SO_2 (24-hour averaging period) exceed the SIL, so a cumulative impact analysis was performed.

In evaluating cumulative impacts with respect to the NAAQS, maximum modeled impacts were added to representative ambient background concentrations and compared to the applicable NAAQS. The Applicant used background data obtained from MassDEP's existing monitoring station on Harrison Avenue in Roxbury and on Von Hillern St. in Boston. The background data, when added to the modeled impacts found that the maximum impacts from emissions from the proposed facility will be below the NAAQS, as indicated below:

Table 4

Comparison of Predicted Impact Concentrations with NAAQS

Pollutant	Averaging Period	Cumulative Impact of Weymouth Compressor Station and Regional Sources ~~Algonquin Compressor Station Impact~~ (µg/m³)	Measured Background (µg/m³)	Background plus Cumulative Impact of Weymouth Compressor Station and Regional Sources~~Compressor Station Total Impact~~ (µg/m³)	NAAQS (µg/m³)	Background plus Cumulative Impact of Weymouth Compressor Station and Regional Sources~~Compressor Station~~ % of NAAQS
NO_2	1-Hour	~~57.85~~81.41	~~91.0~~94.63	~~148.85~~176.04	188	~~79.2%~~93.6%
	Annual	~~7.67~~8.52	~~32.8~~32.88	~~40.47~~41.40	100	~~40.5%~~41.4%
SO_2	24-Hour	~~14.87~~18.41	~~23.1~~13.40	~~37.97~~31.81	365	~~10.4%~~8.7%
$PM_{2.5}$	24-Hour	~~4.87~~7.13	~~16.4~~15.3	~~21.27~~22.43	35	~~60.8%~~64.1%
	Annual	~~1.34~~1.47	~~7.2~~6.5	~~8.54~~7.97	12	~~71.2%~~66.4%

Table 4 Key:

NAAQS = National Ambient Air Quality Standards
NO_2 = Nitrogen Dioxide
SO_2 = Sulfur Dioxide
PM = Particulate Matter
$PM_{2.5}$ = Particulate Matter ≤ 2.5 microns in diameter
% = percent

µg/m^3 = micrograms per cubic meter

The air dispersion modeling analysis also included an evaluation of the Facility's impacts relative to the MassDEP's 24-hour Threshold Effect Exposure Limits ("TELs") and annual Allowable Ambient Limits ("AALs") Guideline values for air toxics. The AALs and TELs were evaluated from Facility-wide sources at both 50% and 100% turbine load. The maximum modeled impacts were compared to the TELs and AALs.

Table 5

Pollutant	TEL (24-hour)			AAL (annual)		
	TEL Limit (µg/m^3)	Modeled concentration (µg/m^3)	percent of limit[1]	AAL Limit (µg/m^3)	Modeled concentration (µg/m^3)	percent of limit[1]
Acetaldehyde	30	~~5.95~~6.01E-02	0.2	0.40	~~9.54~~8.04E-03	~~2.4~~2.0
Acrolein	0.07	~~3.67~~3.71E-02	~~52.5~~53.0	0.07	~~5.88~~4.94E-03	~~8.4~~7.1
Benzene	0.6	~~3.96~~2.17E-01	~~66.0~~36.2	0.1	~~5.66~~4.27E-02	~~56.6~~42.7
1,3 Butadiene	1.20	~~1.91~~1.93E-03	0.2	0.003	~~3.10~~2.60E-04	~~10.3~~8.7
Carbon tetrachloride	85.52	2.60E-04	0.0	0.07	4.00E-05	0.1
Chlorobenzene	93.88	2.20E-04	0.0	6.26	3.00E-05	0.0
Chloroform	132.76	~~2.00~~2.10E-04	0.0	0.04	3.00E-05	0.1
Dichloromethane	100.00	1.40E-04	0.0	60.00	2.00E-05	0.0
Diphenyl	0.34	~~1.52~~1.53E-03	~~0.4~~0.5	0.09	~~2.40~~2.00E-04	~~0.3~~0.2
Ethylbenzene	300	~~1.19~~7.87E-01	0.0	300	~~1.70~~1.55E-02	0.0
Formaldehyde	2.00	~~3.82~~3.86E-01	~~19.1~~19.3	0.08	~~6.92~~5.56E-02	~~86.5~~69.5
Methanol	7.13	~~1.79~~1.80E-02	0.3	7.13	~~2.86~~2.39E-03	0.0
2-Methylnaphthalene	14.25	2.40E-04	0.0	14.25	~~4.00~~3.00E-05	0.0
Naphthalene	14.25	~~1.29~~2.91E-03	0.0	14.25	~~2.40~~3.70E-04	0.0
Phenol	52.33	1.70E-04	0.0	52.33	~~3.00~~2.00E-05	0.0
Propylene oxide	6.00	~~1.71~~6.37E-02	~~0.3~~1.1	0.30	~~1.93~~6.43E-03	~~0.6~~2.1
Styrene	200	1.70E-04	0.0	2	~~3.00~~2.00E-05	0.0
1,1,2,2 Tetrachloroethane	18.67	~~3.00~~3.10E-04	0.0	0.02	~~5.00~~4.00E-05	~~0.3~~0.2
Toluene	80	~~9.00~~5.60E-01	~~1.1~~0.7	20	~~1.29~~1.11E-01	0.6
1,1,2 Trichloroethane	14.84	2.30E-04	0.0	0.06	~~4.00~~3.00E-05	0.1
Vinyl chloride	3.47	1.10E-04	0.0	0.38	~~2.00~~1.00E-05	0.0
xylenes	11.8	~~1.20E+00~~7.86E-01	~~10.2~~6.7	11.8	~~1.72~~1.54E-01	1.3~~1.5~~

Table 5 Notes:
1. – Modeled concentration as a percent of limit.

the criteria for invoking Fail-Safe Review." Additionally, a determination was made that the Atlantic Bridge Project and the Access Northeast Project "are sufficiently distinct in purpose, design, and scope that they have independent utility and can be reviewed separately."

Should you have any questions concerning this Plan Approval, please contact the undersigned by telephone at 508-946-2824, or in writing at the letterhead address.

PROPOSED
Thomas Cushing
Permit Chief
Bureau of Air and Waste

Enclosure

cc: Weymouth Board of Health/Dept. of Health
Weymouth Fire Department
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