ACENTECH

33 Moulton Street
Cambridge MA 02138
617 499 8000
acentech.com

25 September 2015

Vermont Public Service Department
112 State Street
Montpelier, VT 05620-2601

Attention: Aaron Kisicki *** (via email: Aaron.Kisicki@vermont.gov) ***
Special Counsel

Subject: Acoustical Consulting Services
Vermont Wind/Sheffield Wind/Brouha Noise Complaint (PSB Docket 7156)
Acentech Project No. 624219

References: Your 4/17/2014 email with attached documents -
"7156 - 2014.02.28 - Brouha Blomberg Complaint.pdf"
"7156 - 2014.03.28 - Brouha Cavanaugh Tocci Comments.pdf"
"7156 - 2007.08.08 CPG.pdf"
"7156 - 2007.08.08 Final Order.pdf"
"7156 - 2007.10.01 Reconsideration Order.pdf"
"Revised Sheffield Sound Monitoring Plan May 2010.pdf"
"7156 - 2012.02.27 - Operational Sound Level Compliance Test, Wintertime Conditions.pdf"
"7156 - 2012.06.08 - Operational Sound Level Compliance Test - Spring.pdf"
"7156 - 2012.08.27 - Operational Sound Level Compliance Test - Summer.pdf"
"7156 - 2012.12.17 - Sound Report Autumn Conditions.pdf"
"7156 - 2013.05.01 - Order re Mot for Relief.pdf"
"7156 - 2014.03.12 - FW Resp to Brouha 2014.2.28 Filing.pdf"
J. Barnes 4/22/2014 email to you
L. Blomberg 5/20/2014 email with photos of his OILR test setup to me
Your 11/4/2014 email with Vermont Wind data files

Dear Mr. Kisicki:

Introduction

At your request, we reviewed the above-referenced materials and performed field measurements and analysis that relate to a community noise complaint with the Vermont Wind Sheffield Wind Project. These materials include a filing to the Vermont Public Service Board (VPSB) by Les Blomberg of Noise Pollution Clearinghouse (NPC) on behalf of Paul Brouha, a resident near the wind facility, which alleges violations of the project's noise limits at the resident's home. The Brouha Blomberg Complaint filing presents two reports that L. Blomberg had prepared for P. Brouha:

- "Outside to Inside Attenuation at the Brouha Bedroom (2/25/2014)
- "Indoor Wind Turbine Noise Levels at the Brouha Residence and a Critique of Vermont Wind's Quarterly Noise Reports" (2/25/2014)

This filing was submitted by P. Brouha to the VPSB where they were received on 3/3/2014.

In addition, Brion Koning of Cavanaugh Tocci Associates (CTA) reviewed at least one of the above two NPC reports and prepared a peer-review report entitled "Environmental Sound Levels Evaluation - Brouha

Residence" (3/25/2014). This report was submitted by P. Brouha to the VPSB where it was received on 27 March 2014.

The Vermont Wind Sheffield Wind facility incorporates 16 Clipper Liberty 2.5 megawatt (MW) wind turbines and support equipment with a total project nameplate capacity of 40 MW. The facility began operation on 10/19/2011. P. Brouha lives in a farmhouse at 92 Queen Elizabeth Farm Lane in Sutton, VT.

This letter report describes the wind project and the permit conditions that address community noise; offers our comments and suggestions on the L. Blomberg/NPC and B. Koning/CTA submittals; outlines the sound test and analysis that we have performed; and summarizes our conclusions about project compliance inside the Brouha residence. As expected, the results of our study indicate that the wind project sound levels and compliance status estimated inside the second floor west bedroom of the Brouha residence necessarily depend on whether the bedroom windows are closed or open.

Project Noise Conditions

The Certificate for Public Good (CPG, 8/8/2007) and Final Order (8/8/2007) issued by VPSB impose noise conditions on the wind project that include:

- "8. UPC shall construct and operate the Project so that it emits no prominent discrete tones pursuant to the American National Standards Institute (ANSI) standards at the receptor locations, and indoor sound levels at any King George School structure and any surrounding residences do not exceed 30 dBA (Ldn)." VPSB Order (10/1/2007) modified the sound level requirement in CPG Condition 8 to 30 dBA (1-hr Leq).
- "9. In the event noise from operation of the Project exceeds the maximum allowable levels, UPC shall take all remedial steps necessary to bring the sound levels produced by the turbine(s) into compliance with allowable levels, including modification or cessation of turbine(s) operation."
- "10. UPC shall submit to the Board for review and approval a noise monitoring plan to be implemented during the first full year of operation. The Plan shall establish a monitoring program to confirm under a variety of seasonal and climactic conditions compliance with the maximum allowable sound levels described above."

Vermont Wind's noise consultant [David Hessler/Hessler Associates (HA)]) developed a Noise Monitoring Plan (5/26/2010), which was approved for this project. The Plan summarized the project's noise conditions and indicated that continuous sound monitoring would be conducted outdoors at four community locations over a two-week period during each of the four seasons over the first year of operation.

The approved Revised Sheffield Sound Monitoring Plan states "that a site-specific sound test will be conducted in accordance with ASTM standard E966-04 …. to determine the actual amount of attenuation that occurs between exterior and interior sound levels at each of the 4 monitoring locations. The interior sound levels will then be calculated based upon exterior sound levels and the measured attenuation of the structures." A footnote states: "The outside-to-inside sound test will be performed under both windows open and windows closed conditions, weather permitting." The Plan also indicates that if a specific community location cannot be used for the monitoring program, then Vermont Wind should select a comparable alternate location.

2012 Vermont Wind Compliance Measurements and Reports

HA conducted the initial operation sound level compliance measurements for Vermont Wind over a two-week period in the latter half of January 2012. Measurements included continuous sound monitoring at four outdoor locations representative of residences exposed to turbine sound and at four other outdoor locations farther from the turbines and less exposed to turbine sound; the latter locations were selected as proxies for characterizing background ambient sound levels in the area during the compliance test period. HA also conducted sound measurements on 1/18/2012 at two of the four turbine sound

monitoring locations, including an unoccupied lounge at the King George School dormitories on Dareios Road (Vermont Wind Location SM3), in order to characterize the Outdoor-Indoor Level Reductions (OILR) of the structures.

The outdoor-indoor measurements were obtained by HA in general conformance to ASTM Standard Guide E966-04 with a loudspeaker installed outdoors and all windows closed; no data were provided for the windows open condition. HA calculated indoor turbine sound levels based the measured outdoor turbine sound levels, with adjustments for the contribution of background ambient sound (measured at an associated proxy location) and the OILR value (measured at structure or another assumed similar structure), and compared them to the project indoor sound limit of 30 dBA. The above-referenced report, "Operational Sound Level Compliance Test, Wintertime Conditions," presents the sound measurements and concludes that the results demonstrate compliance with the indoor sound limit at each of the four monitoring locations. The spring, summer, and autumn 2012 measurements and analyses (all with windows closed condition), which were also performed by HA and presented in the above-referenced reports, indicate similar results.

2012 NPC Measurements at Brouha Residence for OILR

Following submittal of the first sound compliance report ("….Wintertime Conditions") by Vermont Wind, NPC conducted sound measurements at the Brouha residence on 5/2/2012 to characterize the OILR value of the second-story bedroom façade that faces the turbines. It appears that NPC conducted and reported the measurements carefully and in accordance with many aspects of ASTM Standard Guide E966-04. NPC installed and operated a loudspeaker outside the P. Brouha residence and measured the sound both outside and inside a second-story bedroom with the room's windows open. For these measurements, NPC removed both beds and an area rug from the bedroom. Based on the outdoor sound data presented in the first Vermont Wind sound compliance report and on the results of the OILR sound test at the Brouha residence, which is about 5000 ft northeast of the King George School dormitories on Dareios Road, NPC calculated that the sound of the wind turbines would exceed the indoor project limit of 30 dBA at times in the Brouha bedroom.

Acentech Comments and Suggestions on NPC Measurements and Analysis

Based on our review of the NPC reports and related project documents, we developed the following comments and suggestions:

- We disagree with part of the OILR test procedure employed by NPC and question NPC's results of only 1 dBA sound attenuation from outdoor to indoor.

- We disagree with NPC removing furnishings from the bedroom, including beds and an area rug, in order to reduce sound absorption in the space. (Therefore, we must also disagree with related comments in CTA's letter about NPC's outdoor-indoor measurements). The OILR test procedure in the cited ASTM standard does not direct this modification. We judge that the spirit of the CPG noise conditions is to limit the project sound levels in indoor spaces as they are typically occupied. Removing the beds and rug changed the acoustical characteristics of the bedroom and likely led to measurements inside the bedroom that are not typical of occupied conditions. It is reasonable to expect that NPC would have also made sound measurements in a normally-furnished bedroom and at a typical head position on the bed. NPC removed the furnishings in an effort to obtain a different type of test result (OITL rather than OILR), which is not applicable to the project's permit conditions. The ASTM standard describes the difference between OILR and OITL values:

  > "This guide may be used to determine the outdoor-indoor level reduction (OILR), which is the difference in sound pressure between a specified outdoor sound field and the resulting sound pressure level in the room abutting the test facade or facade element……..With further measurements under restricted conditions, a basic property of

a facade or facade element, the outdoor-indoor transmission loss, OITL, may be determined."

- NPC did not adjust the test results to account for the difference between the broadband test loudspeaker sound spectrum and a representative wind turbine sound spectrum at the Brouha residence when developing an overall A-weighted value (dBA) for OILR. (Note: HA also did not appear to adjust its test results to a representative wind turbine sound spectrum). Although this issue did not affect the overall findings of our study, we would still recommend that an overall OILR dBA value developed for a wind turbine project use a wind turbine sound spectrum. This issue is discussed further in a following section with our 2014 OILR test results.

- The results in the NPC Attenuation report show virtually no reduction (1 dBA) in the broadband sound of the loudspeaker between outdoors and indoors. This value is much lower than is normally expected, even for large open windows. (Note: Acentech measurements in July 2014 under similar test conditions did generally agree with this value; and depending on the measurement location within the room, yielded an OILR value of about 1 to 3 dBA with the windows fully open.)

- At our request, NPC provided additional photos and information that helped to clarify the field conditions during their 2012 OILR test.

- The ASTM E966 -04 "Standard Guide for Field Measurement of Airborne Sound Insulation of Building Facades and Facade Elements (2004)" states: "14.1 Precision — No body of experience in the use of this guide exists at present; however, it is estimated that the repeatability standard deviation of the test procedure is of the order of 2 to 4 dB, depending on frequency." Therefore, OILR results may vary by up to 2 to 4 dB. The NPC report does not acknowledge or account for this degree of uncertainty in its measurements and conclusions.

- We agree with NPC that Vermont Wind did not strictly follow the approved Noise Monitoring Plan in several key areas – the OILR values at all four monitoring locations were not measured, no alternate locations were used, and also, the OILR for the windows open (partial or full) condition was not used in calculating the summer (and perhaps spring and fall) indoor sound levels for the project.

- We believe that the two year gap between the measurements and reports by HA and NPC in 2012 and the reports by NPC and CTA in 2014 are inconsequential to understanding the merit of P. Brouha's 2014 filings.

- Without clear measurements at the Brouha residence, it would be difficult for us to judge the accuracy of the NPC measurements and analysis, and compliance/noncompliance with the project sound limits at this community location.

2014 Acentech Measurements at Brouha Residence

In an effort to judge compliance/noncompliance at the P. Brouha residence, we suggested that Vermont Public Service Department (VPSD), Vermont Wind, and P. Brouha consultants agree on the estimated outdoor turbine sound levels for this location, including a background ambient sound adjustment; we understand that all parties currently do agree with the turbine project sound levels outside the Brouha residence. To estimate the indoor turbine sound levels, we also recommended that outdoor-indoor sound measurements be conducted at the P. Brouha residence with the second floor bedroom normally furnished and with its windows closed and opened.

Acentech performed a series of measurements at the Brouha residence on 7/1/2014 to determine the attenuation of exterior sound to the interior of the home's second floor west bedroom. Our measurements, which were guided by the Vermont Wind's Noise Monitoring Plan, and more specifically, by ASTM Standard

Guide E966-04, were aimed to characterize the OILR of the bedroom's structure. As stated in the Revised Sound Monitoring Plan, the outside-to-inside sound test was performed with the windows open and closed. To determine the actual attenuation of the structure within the context of VPSB's Certificate for Public Good and Final Order for this wind turbine project, which limits the indoor sound of the project to 30 dBA, we requested that the bedroom be in its normally furnished condition for our test. The procedural steps in our overall OILR test method were similar to the steps employed by HA and NPC in 2012. We chose to use the *Calibrated Source Method* and the *Nearby Average Method* in ASTM Standard Guide E966-04 for quantifying the outdoor sound level produced by the speaker and to collect both 1/3-octave band and full octave band data for our OILR test. This procedure is consistent with the OILR definition in Section 3.2.4 of the standard, which states: "outdoor-indoor level reduction, OILR—in a specified frequency band, the difference between the time-averaged exterior sound pressure and the space-time average sound pressure in a room of a building." For the *Calibrated Source Method*, we measured the speaker sound output under a free-field condition (speaker pointed away from the residence and other reflecting surfaces); and for the *Nearby Average Method,* we measured the sound field just outside the residence's bedroom façade with the speaker in its normal test position pointing toward the facade. As noted below, we employed the octave band data from the OILR test and octave band data for the Clipper C96 wind turbine to develop an overall A-weighted OILR value (dBA) for our analysis.

Figure 1 is an aerial photograph that identifies the location of the Vermont Wind Sheffield Wind Project, the Brouha residence, and the King George School dormitories on Dareios Road. The latter location was used as Location SM3 for the project operational sound monitoring program by HA. Figure 2 shows photographs of the OILR test conditions at the Brouha residence. They display the elevated speaker on a bucket truck in the general path between the turbines and the second floor bedroom windows, the bedroom windows and exterior facade, and the bedroom interior. The bedroom was modestly furnished and included a bed for our test. Table 1 lists the type of acoustic instrumentation that we employed to generate high-level broadband sound (i.e., pink noise) across the outside façade of the bedroom and to measure sound outside and inside the bedroom.

Figure 3 presents the 1/3-octave band sound pressure levels that we measured outside the façade with the speaker on, and inside the bedroom (center of bedroom) with the speaker on and off and the windows in three different conditions: fully closed, partially open, and fully open. The data confirm that the speaker produced sufficiently high-level broadband sound for our OILR test.

Table 2 lists the measured octave band sound pressure levels for the same conditions as plotted in Figure 3, adjustment of the measured data for the contribution of ambient sound to the total sound measured at the center of the bedroom with the speaker on, adjustment to normalize the outside sound spectrum to a representative wind turbine spectrum (Clipper C96 wind turbine at 9290 ft), and calculation of the overall A-weighted OILR values for the Brouha bedroom structure. Octave band data were employed in this procedure since the Clipper wind turbine sound data were available in octave band format. The OILR values that we determined for distant wind turbine sound are:

- Windows fully closed – 25 dBA
- Windows partially open – 6 dBA
- Windows fully open – 1 dBA

We obtained similar OILR values with additional measurements at different locations in the bedroom. Average data measured around the bedroom yielded the following OILR values:

- Windows fully closed – 25 dBA
- Windows partially open – 9 dBA
- Windows fully open – 3 dBA

The OILR values of 1 to 3 dBA for fully open windows are consistent with NPC's test result for the same Brouha bedroom and the OILR value of 25 dBA for fully closed windows is similar to HA's test result for the King George School dorm facade.

An OILR value necessarily depends on the spectrum of a sound source (e.g., nearby highway traffic, distant wind turbine, or local lawnmower). This fact is noted in the introduction of ASTM Standard Guide E966-04:

”The sound transmission of a building facade or facade element as measured under field conditions is dependent not only on the physical characteristics of the facade, but also on the characteristics of the incident sound field used to make the measurement.” If we did not normalize the our test results to a distant wind turbine sound spectrum, they would still yield OILR values of 1 to 3 dBA and 6 to 9 dBA for, respectively, windows fully open and windows partially open conditions, but they would yield an OILR value of 32 dBA rather than the above 25 dBA for the windows fully closed condition.

Acentech Project Sound Estimates at Brouha Residence

We have developed project sound estimates at locations outside and inside the Brouha residence based on HA sound monitoring data, a distance adjustment from the HA monitoring location to the residence, and Acentech OILR test results at the residence. The following paragraphs describe our calculation methods.

Sound data collected by HA during the four operational sound surveys were provided to us in digital format for one-hour and ten-minute intervals. The project-only Leq sound levels at Location SM3 (King George School dormitories on Dareios Road (Location SM3) were derived from the measured total sound levels with adjustments for measured ambient background sound levels and exclusions for intervals with low hub height wind speeds (≤ 4 m/s) without significant turbine operation. We evaluated the derived one-hour Leq project-only sound levels for rolling 60-minute periods based on the ten-minute interval data.

The derived project-only sound levels at SM3 were adjusted by -2 dBA to yield estimated project-only sound levels outside the Brouha residence. This adjustment is consistent with the approved Noise Monitoring Plan and accounts for the greater distance from the wind turbine project to the Brouha residence than to SM3 (9290 ft vs. 7180 ft). HA and NPC have both agreed with this -2 dBA adjustment.

The OILR values for the Brouha second floor west bedroom structure that were determined by Acentech were applied to the estimated project-only sound levels outside the Brouha residence. The attenuation values for the structure ranged from 25 dBA with the windows fully closed to just 1 to 3 dBA with the windows fully open. We note that the ASTM Standard Guide E966 -04 presents an estimated standard deviation of 2 to 4 dB for a measured OILR value and that this tolerance is not included in our results.

Table 3 summarizes the percentages of monitoring time that the estimated project-only sound levels exceeded the applicable 30 dBA one-hour Leq indoor project standard at the Brouha residence during each of the four Vermont Wind operational sound monitoring surveys. The equivalent outside criteria for comparison with the project-only sound measured at Location SM3, which are listed in Table 3, are intended to meet 45 dBA outside the Brouha residence and 30 dBA inside 2nd floor west bedroom of the Brouha residence. The criteria include a 2 dBA adjustment for greater distance from the project to the residence than to SM3 and the OILR adjustments provided by the residence’s façade. The table also presents results for the estimated project-only outdoor sound levels at the Brouha residence; these values are provided only for comparison purposes with other similar facilities in the state (Lowell and Georgia Mtn.) that have an outside standard of 45 dBA. Note that the table lists project-only criteria at SM3 that are equivalent to 45/30 dBA (outdoor/indoor) criteria at the Brouha residence.

The results indicate that estimated project-only sound outside the Brouha residence exceeded 45 dBA less than 1% of the time during the winter 2012 survey; 0% during the spring and summer 2012 surveys; and about 0.1% of the time during the fall 2012 survey. For the indoor locations in the second floor west bedroom of the Brouha residence (center of room and around the room), the estimated project-only sound did not exceed 30 dBA with the windows fully closed during any survey, but did exceed 30 dBA with the windows partially or fully open during most of the other surveys. During the summer, a time when windows are most likely to be open, the percentage of time exceeding 30 dBA ranged from 0% (windows partially open) to less than 1% (windows fully open). During the winter, when windows are more likely to be closed, the percentage of time exceeding 30 dBA ranged from less than 6 to 8% (windows partially open) to about 10 to 12% (windows fully open). And during the shoulder seasons of spring and fall, when windows are likely to be open at times, the percentage of time exceeding 30 dBA ranged from about 2 to 6% (windows partially open) and about 10 to 14% (windows fully open).

Results and Conclusions

We have reviewed information provided by Vermont Wind and NPC and conducted an OILR test at the Brouha residence. In addition, we have estimated the percentage of time that the project-only sound levels may have exceeded the permit level of 30 dBA indoor at the Brouha residence. We note that the project-only sound levels should be considered as estimates since they are based on total sound levels and ambient background sound levels that were measured at other locations than the Brouha residence and included adjustments outlined in the approved Noise Monitoring Plan without consideration of any measurement tolerances. The results indicate project-only sound levels that at a few times did exceed an outdoor criterion that only applies to two other wind facilities in Vermont; and with the bedroom windows open, at times did exceed the indoor criterion that applies to this facility. The results also indicate that project-only sound levels did not exceed the indoor criterion at any time with the bedroom windows fully closed.

****

Please contact me if you have any questions or comments about our study or this letter.

Sincerely yours,

ACENTECH INCORPORATED

James D. Barnes

Figures 1 - 3
Tables 1 - 3

xc: Geoff Commons (geoff.commons@vermont.gov)

J:\624219-VPSD-Sheffield-BrouhaResidence092515.docx

Figure 1.
Aerial Photograph Showing Sheffield Wind Turbines, Brouha Residence, and King George School Dormitories on Dareios Road (Vermont Wind Monitor Location SM3).

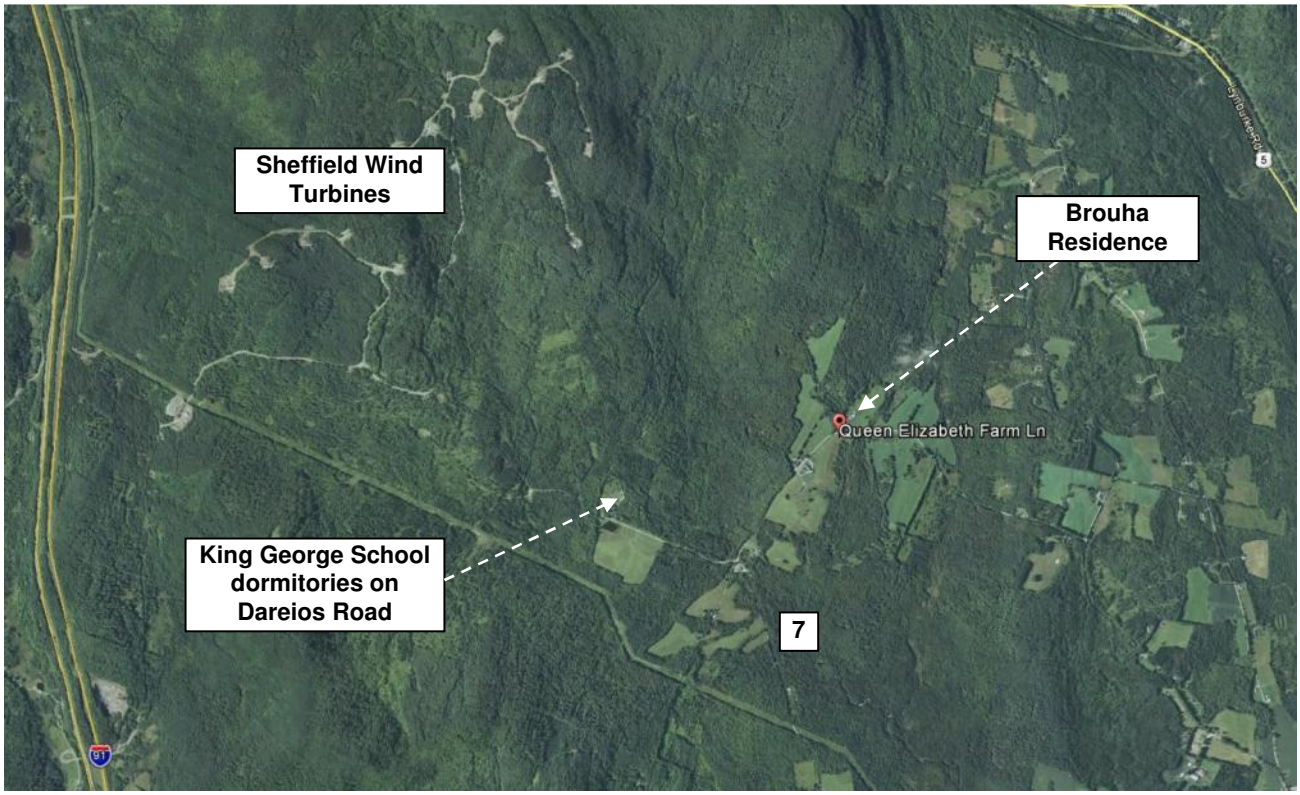

Figure 2.
Photographs of Brouha Residence and Acentech OILR Sound Test Conditions (7/1/2014).

Loudspeaker and Residence

2nd Floor Bedroom – Partially Open Windows

2nd Floor Bedroom – Fully Closed Windows

Inside 2nd Floor Bedroom – Fully Open Windows

Figure 3.
One-Third Octave Band Sound Pressure Levels Measured during OILR Test for 2nd Floor West Bedroom Structure (Center of Bedroom) at Brouha Residence by Acentech (7/1/2014).

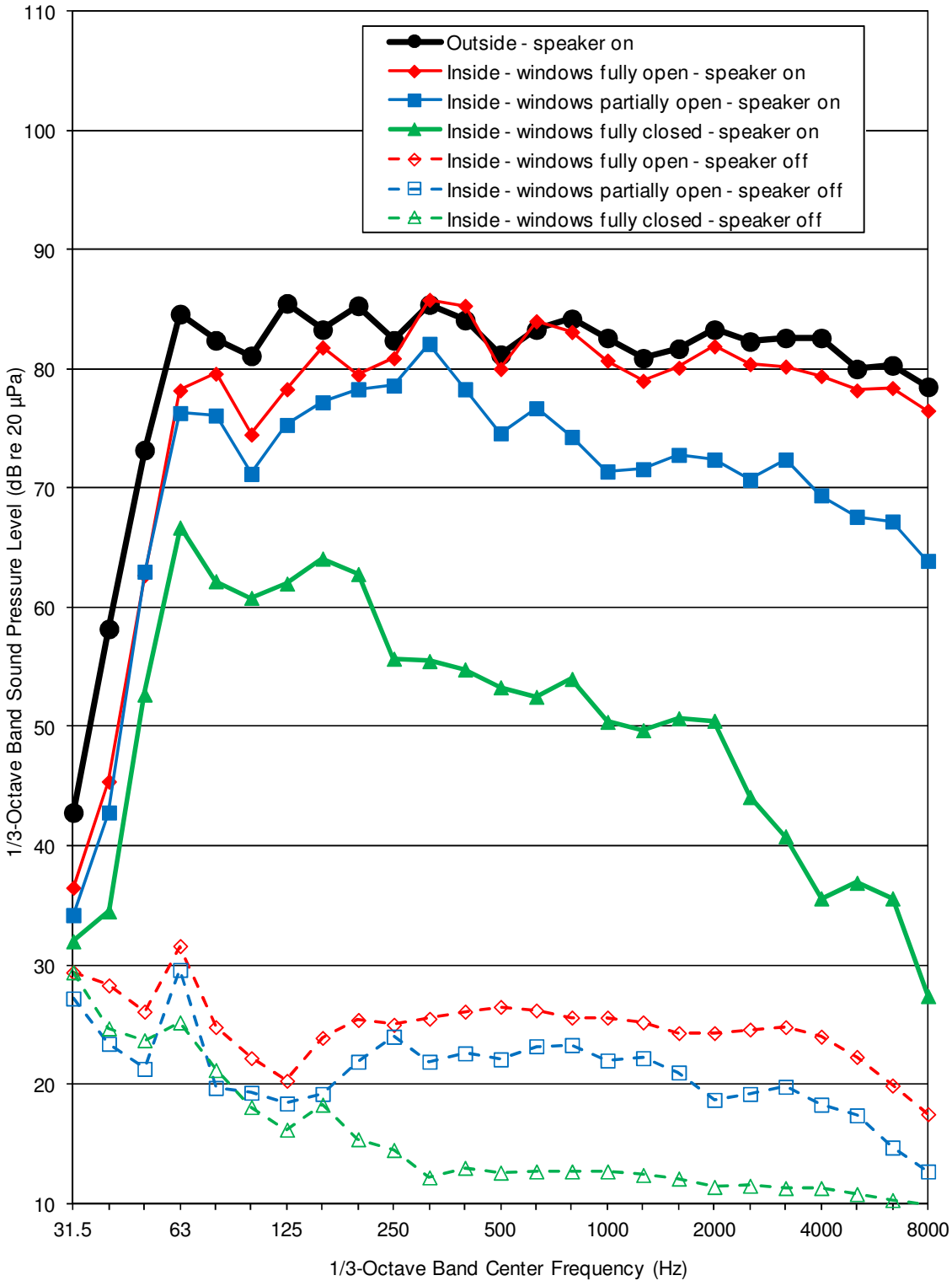

Table 1.
Type of Acoustic Instrumentation Used for OILR Sound Test at Brouha Residence (7/1/2014).

Instrument Type	Manufacturer	Model
Sound Generator	Minirator	MR1
Powered Speaker	Peavey	Impulse 1012P
Precision Sound Level Meter and Octave Band Analyzer	Rion	NA-28
Preamplifier	Rion	NH-23
1/2" Microphone	Rion	UC-59
Acoustic Calibrator	Norsonics	1251

Table 2.
OILR Values for 2nd Floor West Bedroom Structure (Center of Bedroom) at Brouha Residence Based on Speaker Measurements by Acentech (7/1/2014).

Description	Octave Band Center Frequency (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	Overall dBA
Speaker ON (broadband pink noise plus ambient)										
Outside	60	87	89	89	88	88	87	87	84	
Inside at Center of 2nd Floor West Bedroom										
windows fully closed	39	68	68	64	59	57	54	43	37	
windows partially open	44	80	80	85	82	78	77	75	70	
windows fully open	47	82	84	88	89	86	86	84	82	
Ambient (Speaker OFF)										
Inside at Center of 2nd Floor West Bedroom										
windows fully closed	35	29	23	19	18	18	17	16	15	
windows partially open	33	31	24	27	28	28	25	24	18	
windows fully open	35	34	27	30	31	30	29	29	23	
Speaker ON only (broadband pink noise only, adjusted for background)										
Inside at Center of 2nd Floor West Bedroom										
windows fully closed	37	68	68	64	59	57	54	43	37	
windows partially open	44	80	80	85	82	77	77	75	70	
windows fully open	46	82	84	88	88	86	86	84	82	
OILR for 2nd Floor West Bedroom Building Structure (based on center of room data)										
windows fully closed	23	19	21	25	29	31	33	44	47	
windows partially open	16	7	8	5	6	10	10	12	14	
windows fully open	13	5	5	1	-1	1	2	3	2	

Apply Octave Band OILR Values Measured at Brouha Residence to Wind Turbine Sound Spectrum *(used single turbine at 9290 ft)*										
Turbine sound power level (Lw) (ref: Hessler Assoc. 2006 Cohocton, NY report for Clipper C96)	114.5	110.2	108.8	105.8	105.0	99.3	90.7	85.1	68.3	
Distance and atmospheric attenuation only (Cadna/A program with 10C and 70% relative humidity).	77	77	78	80	82	87	104	170	408	
Outside ---- one turbine sound spectrum at 9290 ft	37	33	31	26	23	12	-14	-85	-340	23
Estimate Inside Turbine Sound if have 45 dBA turbine sound level outside Brouha residence										
Outside ---- 45 dBA turbine sound spectrum	59	55	53	48	45	34	8	<0	<0	45
Inside at Center of 2nd Floor West Bedroom										
windows fully closed	37	36	32	23	16	3	<0	<0	<0	20
windows partially open	44	47	44	43	39	24	<0	<0	<0	39
windows fully open	46	50	48	47	46	32	7	<0	<0	44

OILR Normalized to Turbine Sound Spectrum for 2nd Floor West Bedroom Building Structure (based on center of room data)										
windows fully closed	23	19	21	25	29	31	33	44	47	25
windows partially open	16	7	8	5	6	10	10	12	14	6
windows fully open	13	5	5	1	-1	1	2	3	2	1

Table 3.
Estimate of Time Exceeding Potential Project Sound Level Criteria at Brouha Residence (Center of Bedroom) Based on HA 2012 Measurements at King George School Dormitories on Dareios Road.
(Rolling-Hour Data Collected at Vermont Wind Monitor Location SM3)

Condition	Criteria* (dBA)	% of Time Exceeding Criteria for Total Monitoring Period			
		Winter (335 total hrs)	Spring (384 total hrs)	Summer (375 total hrs)	Fall (335 total hrs)
Outside Brouha Residence	47	0.8%	0.0%	0.0%	0.1%
Inside Brouha 2nd Floor West Bedroom (Center of Room OILR)					
Windows fully closed	57	0.0%	0.0%	0.0%	0.0%
Windows partially open	38	7.2%	5.7%	0.0%	5.9%
Windows fully open	33	11.7%	11.5%	0.8%	14.3%
Inside Brouha 2nd Floor West Bedroom (Average Room OILR)					
Windows fully closed	57	0.0%	0.0%	0.0%	0.0%
Windows partially open	41	5.3%	3.4%	0.0%	2.0%
Windows fully open	35	9.5%	10.1%	0.0%	10.7%

*Equivalent outside criteria for wind turbine project sound (without ambient sound) measured at Vermont Wind Monitoring Location SM3 to meet 45 dBA outside Brouha residence and 30 dBA inside 2nd floor west bedroom of Brouha residence. The criteria include -2 dBA adjustment to account for the greater distance from the Brouha residence than from SM3 to the wind turbine project (9290 ft vs. 7180 ft), plus the Outdoor-Indoor Level Reductions (OILR) associated with windows closed (-25 dBA), windows partially open (-6 dBA), and windows fully open (-1 dBA) conditions that Acentech measured in the center of the 2nd floor bedroom structure at the Brouha residence. Results are also presented for the average OILR values associated with windows closed (-25 dBA), windows partially open (-9 dBA), and windows fully open (-3 dBA) conditions that Acentech measured around the 2nd floor bedroom at the Brouha residence.

As stated above in this report, the results for “Outside Brouha Residence” are provided only for comparison purposes with other similar facilities in the state (Lowell and Georgia Mtn.) that have an outside limit of 45 dBA.

Criteria are 1-hr A-weighted Leq values. Analysis used rolling 60-minute periods based on the 10-minute interval data collected by HA.