

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

Petition of BNE Energy Inc. for a
Declaratory Ruling for the Location,
Construction and Operation of 4.8 MW
Wind Renewable Generating Projects on
Flagg Hill Road in Colebrook,
Connecticut ("Wind Colebrook South")

RECEIVED
APR 20 2011

Petition No. 984

CONNECTICUT
SITING COUNCIL
April 14, 2011

**SECOND SUPPLEMENTAL PRE-FILED TESTIMONY OF NOISE CONTROL
ENGINEERING, INC., BY MICHAEL BAHTIARIAN, INCE Bd. Cert.**

**Q51. Did you undertake any background noise monitoring in Colebrook,
Connecticut?**

A51. Yes, under my direction staff from Noise Control Engineering, Inc. conducted the background noise survey.

Q52. Where?

A52. The noise monitoring equipment was installed at two locations on the periphery of the Colebrook North (Petition # 984) and Colebrook South (Petition #983) projects. Both locations were on private property of Colebrook residents. The first location was near the end of Flagg Hill Road in the vicinity of receptor location M1. The second location was northwest of Lake Schwartz on Wagner property nearest to receptor location R8. The latitude and longitude coordinates for both locations are given in Table 1 of NCE report TM2011-014, dated April 14, 2011 (see Exhibit NCE7, attached). The locations are also shown in Figure 1 of NCE report TM2011-014 (Exhibit NCE7).

Q53. When was the equipment installed?

A53. The equipment was installed on the afternoon of Friday, March 25, 2011 by one engineer from Noise Control Engineering, Inc.

Q54. What type of equipment was used?

A54. At the location near M1 (Petition #983), NCE staff under my direction installed a logging sound level meter, manufactured by Rion, Model NL-06. At the location near R8 (Petition #984), NCE staff installed a logging sound level meter manufactured by Norsonic, model NOR140.

Q55. When was the equipment removed?

A55. Both devices were removed the afternoon of Monday, April 4, 2011.

Q56. What was the time period for monitoring sound at those locations?

A56. Both sound level meters were on site for 10 nights. However, due to limitations of the battery power, the sound level meter near M1 recorded sound pressure level data for only 7 days and the sound level meter near R8 recorded data for only 4 days.

Q57. What were the results?

A57. The complete results and data are given in NCE report TM2011-014, dated April 14, 2011 (see Exhibit NCE7). Summarizing, the average night background noise level at Site #984 is 31 dB(A) with each night dropping below 27 dB(A) and one night reaching as low as 24 dB(A). The results from Site #983 show the average background noise levels was 30 dB(A). The background noise level dropped as low as 22 dB(A) for 3 of the 7 nights and 28 dB(A) for the remaining nights. As defined in the Connecticut DEP Control of Noise regulation, no prominent discrete tones were found in the one-third octave band measurements taken at either locations.

Q58. When did the petitioner do its background noise monitoring?

A58. According to the appendix attached to Exhibit M in each petition, noise monitoring was done on the afternoon of April 1, 2010 and the morning of April 2, 2010. The longest monitoring period was 20 minutes. The latest any measurements that were taken by the

petitioner was at 1:15 am. The lowest sound levels measured by our monitoring was mostly after this time period.

Q59. Have you drawn any conclusions with respect to the average background noise level during the night at these locations?

A59. Yes.

Q60. What conclusions have you reached?

A60. My preliminary conclusions are that both locations are extremely quiet locations, much quieter than indicated by the brief sampling or modeling done by the petitioner.

Q61. Does this change the results of the predicted sound and comparison to CTDEP noise limits?

A61. No, as the CTDEP regulations only allow for adjustment if there is high background noise and not if there is low background noise.

Q62. Then why is this significant?

A62. These measurements show that the proposed wind turbine operation will have noise levels that are around 20 dB higher than the background. The petitioner's own report states that a 10 dB increase is perceived as a doubling of loudness (see Noise Background). A 20 dB increase would be a quadrupling in loudness. This is extreme.

April 14, 2011

Date

s/Michael Bahtiarian

Noise Control Engineering, Inc.
By: Michael Bahtiarian

TECHNICAL MEMO 2011-014



***Background Noise Monitoring at Proposed
Colebrook Wind Turbine Sites***

Allan Beaudry
Michael Bahtiarian, INCE Bd. Cert.

April 14, 2011

NCE JOB No. 11-022F

Prepared for:
Fairwind CT, Inc.
c/o Mr. Nicholas Harding, Esq.
Reid and Riege, PC
One Financial Plaza
Hartford, CT 06103

Prepared by:
NOISE CONTROL ENGINEERING, Inc.
799 Middlesex Turnpike
Billerica, MA 01821
978-670-5339
978-667-7047 (fax)
nonoise@noise-control.com (Email)



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1.0 INTRODUCTION

Noise Control Engineering, Inc. (NCE) was retained by Fairwind CT, Inc. to monitor the background noise adjacent to property where six wind turbines have been proposed in Colebrook, Connecticut. NCE measured background sound levels from Friday March 25, 2011 through Friday April 1, 2011.

2.0 INSTRUMENTATION

Sound monitoring was performed using two different Sound Level Meters (SLM). One-third octave band and overall A-weighted logged sound pressure level (SPL) measurements were made using a Norsonic, Model Nor140 Sound Analyzer. A-weighted SPL monitoring was performed at a second location using a Rion, Model NL-06 Sound Level Meter. Both instruments were field calibrated prior to the noise surveys and have been laboratory calibrated within the past 12 months. Calibration certificates are provided in Appendix A.

Both SLMs were set to 5 minute sampling. The response was set to "slow" and weighting set to "A" on both SLMs. Both SLMs were outfitted with waterproof wind screens as shown in Figures 1 and 2.

3.0 MEASUREMENT LOCATIONS

A description and the latitude/longitude for each monitoring location are given in Table 1. A Garmin GPS 72H was used to determine the geographical positions. Figure 1 shows these two locations along with the proposed locations for the six wind turbines.

TABLE 1: Noise Monitoring Locations

SITE	DESCRIPTION	LATITUDE LONGITUDE
1	Wagner Property, 117 Pinny Street, Northwest of Lake Schwartz	41° 58' 16.91" N 73° 07' 28.22" W
2	Flagg Hill Road, South of Cul-de-Sac	41° 57' 35.43" N 73° 08' 29.95" W

3.1 Local Weather

Table 2 lists the average weather as measured at Bradley International Airport. The airport is located in Windsor Locks, CT and is approximately 25 miles east of the noise monitoring locations in Colebrook, CT. This is the closest location where detailed weather information is recorded.

TABLE 1: Weather as Measured at Bradley International Airport

		Fri	Sat	Sun	Mon	Tues	Wed	Thurs	Fri
		3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1
Day	Avg. Temperature (°F) ¹	39	33	36	39	40	49	42	38
	Avg. Wind Speed (mph)	17	14	14	17	13	9	9	11
	Wind Direction	WNW	NW	WNW	WNW	WNW	S	SE	NNW
Night	Avg. Temperature (°F)	28	25	25	28	31	32	37	34
	Avg. Wind Speed (mph)	11	10	10	11	8	6	8	12
	Wind Direction	WNW	WNW	NW	WNW	NW	W	SSE	N

4.0 MEASUREMENT RESULTS

Continuous (logged) one-third octave and overall A-weighted SPL measurements were made at Site #1 and continuous overall A-weighted SPL measurements were made at Site #2.

The continuous sound monitoring instruments were installed on Friday March 25, 2011 and were retrieved on April 4, 2011. The instruments were installed at the two sites at 3:45pm and 4:45pm, respectively. Neither instrument's batteries lasted until April 4th; this is due the cold weather. The unit at Site #1 lasted until Tuesday, March 29 while the unit at Site #2 lasted until Friday, April 1. Figures 2 and 3 show photographs of the installations at Sites #1 and #2, respectively. All logged data used were at least one hour from the presence of the engineer on site.

Tables 2 and 3 tabulate the day, evening, and night L₉₀ noise levels for each day for sites 1 and 2, respectively. It should be noted that "daytime" is defined as the period between 7am and 7pm, "evening" is the period between 7pm and 10pm and "night" is the period between 10pm and 7am. These periods are commonly used for acoustical engineering purposes.

Appendix B includes graphs of the continuous monitoring data. Each graph shows the five minute sampled L₉₀ sound pressure level over the monitoring period. L₉₀ is the level exceeded 90% of the time (five minutes in this case) and is also typically used as the measure of background or ambient sound.

Appendix C includes graphs of the one-third octave band monitoring data collected at Site #1. One-third octave band L₉₀ data for 3AM, 11AM, 3PM and 11PM are shown in Graphs B-1 through B-4, respectively. Each graph shows the levels for March 26 – March 28. NCE has found there to be no prominent discrete tones as defined in the Connecticut Department of Environmental Protection (CTDEP) Control of Noise regulation, reference [1].

TABLE 2: Site #1; Summary of Average L₉₀ Sound Measurements.
All values in dB(A).

Day	Date	Day 7am to 7pm	Evening 7pm to 10pm	Night 10pm to 7am
Friday	3/25/11	-	31	27
Saturday	3/26/11	36	31	33
Sunday	3/27/11	37	35	34
Monday	3/28/11	40	35	31
Minimum	-	36	31	27
Average	-	38	33	31

TABLE 3: Site #2; Summary of Average L₉₀ Sound Measurements.
All values in dB(A).

Day	Date	DAY 7am to 7pm	EVENING 7pm to 10pm	NIGHT 10pm to 7am
Friday	3/25/11	-	33	26
Saturday	3/26/11	36	31	33
Sunday	3/27/11	37	38	36
Monday	3/28/11	40	35	31
Tuesday	3/29/11	39	32	28
Wednesday	3/30/11	28	24	23
Thursday	3/31/11	31	32	33
Friday	4/1/11	33	34	-
Minimum	-	28	24	23
Average	-	35	32	30

5.0 SUMMARY

Figure 4 is a summary of all the background noise data (given in Tables 2 & 3) showing the average sound pressure level over all days tested, for each period (day, evening, & night) for each site. The average night background noise level at Site #1 is 31 dB(A) with each night dropping below 27 dB(A) and one night reaching as low as 24 dB(A). Results from Site #2 show the background noise levels dropping to 22 dB(A) for 3 of the 7 nights and 28 dB(A) for the remaining nights. The average background noise during the night period at Site #2 was 30 dB(A). As defined in the Connecticut DEP Control of Noise regulation, no prominent discrete tones were found in the one-third octave band measurements taken at Site #1.

REFERENCES

1. Connecticut Department of Environmental Protection's noise control regulations (Regulations of Connecticut State Agencies (RCSA), Title 22a, Sec 22a-69-1-2-r)

FIGURE 1: Background Noise Monitoring Locations (See Table 1 for Details)

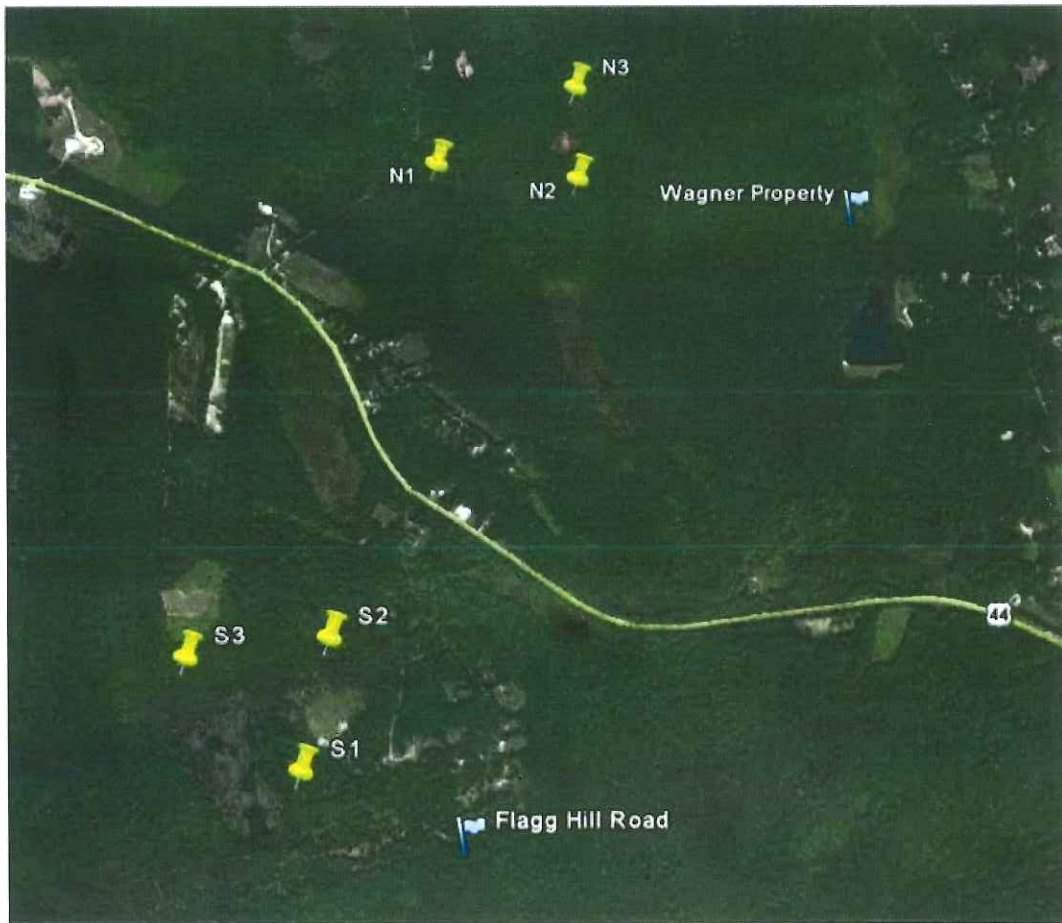


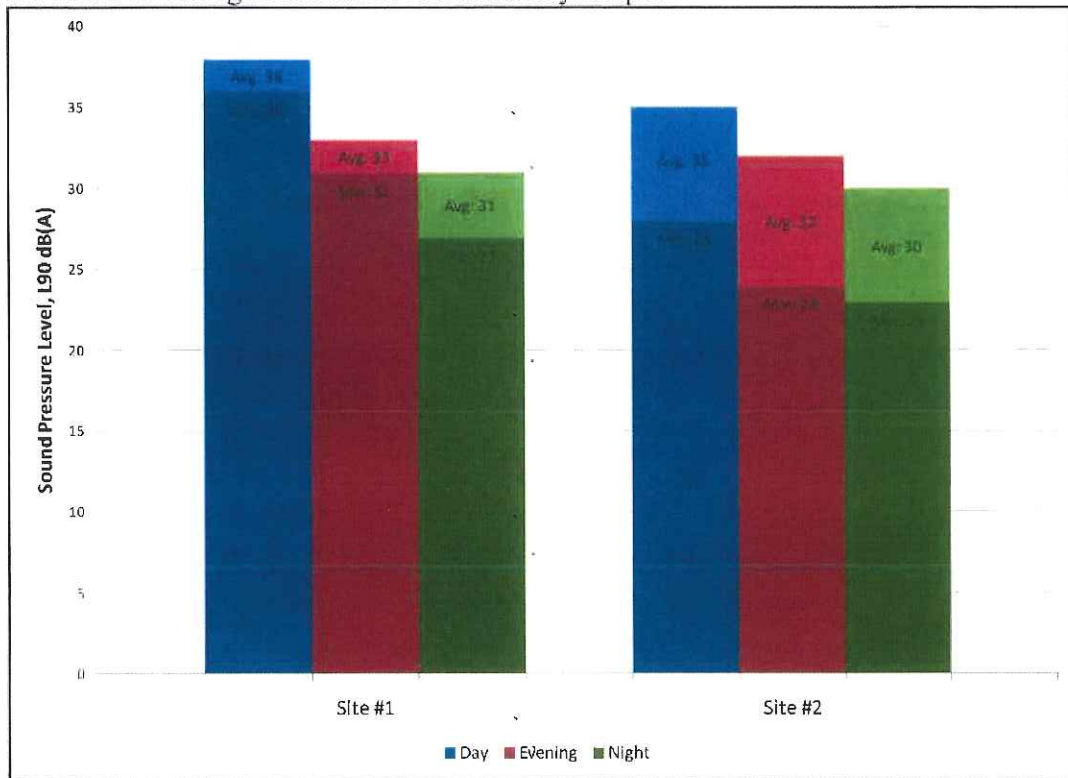
FIGURE 2: Installation Location for Site #1; Wagner Property, NW of Lake.



FIGURE 3: Installation Location for Site #2; Flagg Hill Road, End of Cul-de-Sac.



FIGURE 4: Background Noise Data Summary Graph.



APPENDIX A:

Calibration Certificates

Calibration Certificate No.23509

Instrument:	Sound Level Meter	Date Calibrated	3/14/2011	Cal Due					
Model:	140	Status	<table border="1"><tr><td>Received</td><td>Sent</td></tr><tr><td>X</td><td>X</td></tr></table>	Received	Sent	X	X		
Received	Sent								
X	X								
Manufacturer:	Norsonic	In tolerance							
Serial number:	1403980	Out of tolerance							
Tested with:	Microphone 1225 s/n 112883	See comments							
	Preamplifier 1209 s/n 13794	Contains non-accredited tests:	Yes	No					
Type (class):	1	Calibration service:	Basic	X	Standard				
Customer:	Scantek, Inc.	Address:	6430 Dobbin Road, Suite C, Columbia, MD 21045						
Tel/Fax:	410-290-7726 / 410-290-9167								

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., 06/07/2005
SLM & Dosimeters – Acoustical Tests, Scantek Inc., 06/15/2005

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

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence	Cal. Due
				Cal. Lab / Accreditation	
483B-Norsonic	SME Cal Unit	31052	Sep 10, 2010	Scantek, Inc / NVLAP	Sep 10, 2011
DS-360-SRS	Function Generator	33584	Oct 5, 2009	ACR Env / A21A	Oct 5, 2011
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Sep 3, 2010	ACR Env / A21A	Sep 3, 2011
HM30-Thommen	Meteo Station	1040170/39643	Jun 26, 2010	ACR Env / A21A	Dec 26, 2011
Pt Program 1019 Norsonic	Calibration software	v 5.0	Validated July 2009		
1251-Norsonic	Calibrator	30878	Dec 7, 2010	Scantek, Inc / NVLAP	Dec 7, 2011

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 (%)
22.3 °C	101.26 kPa	47.8 %RH

Calibrated by	Kristen van Otterloo	Checked by	Mariana Buzduga
Signature	<i>Kristen van Otterloo</i>	Signature	<i>Mariana Buzduga</i>
Date	3/14/11	Date	3/14/2011

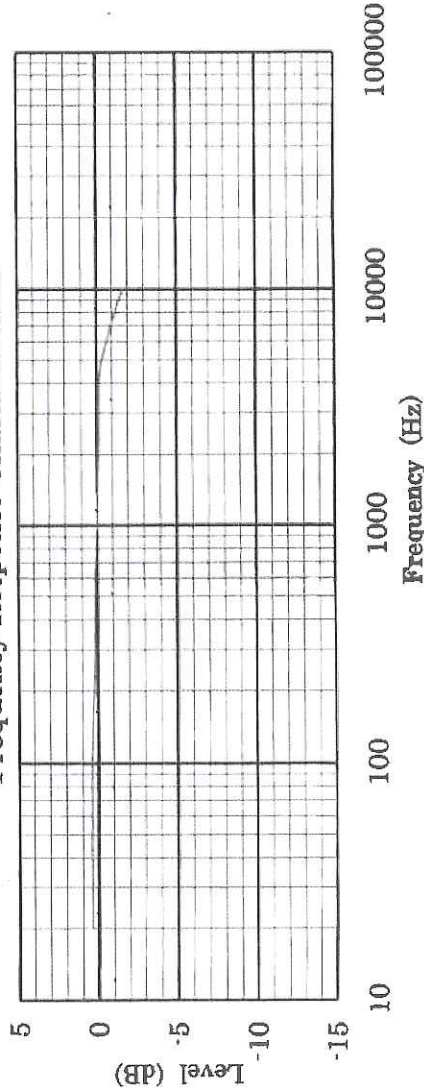
リオン株式会社 CALIBRATION CHART FOR CONDENSER MICROPHONE

品名	1 / 2 インチ・エレクトレットマイクロホン	測定者	永 未
型式	UC-52	製造番号	131704
校正日	2010年8月17日	温度・湿度	25 °C 45 %RH
		気圧	993 hPa

音場感度レベル -33.6 dB (0 dB=1V/Pa, at 1000Hz)

静電容量 17.6 pF

Frequency Response Characteristics



取り扱い上の注意

- 水漏れ、その他の液体の付着は絶対避けてください。
- 高湿度環境下での長時間使用は避けてください。
- 大きな衝撃を加えないでください。
- 保管には高温多湿な場所を避けてください。

West Caldwell Calibration Laboratories, Inc.
 uncompromised calibration
 1575 State Route 96, Victor NY 14564



REPORT OF CALIBRATION

Rion Integrating Sound Level Meter

for
 Model No.: NL-06
 Preamplifier Model No.: NH-19

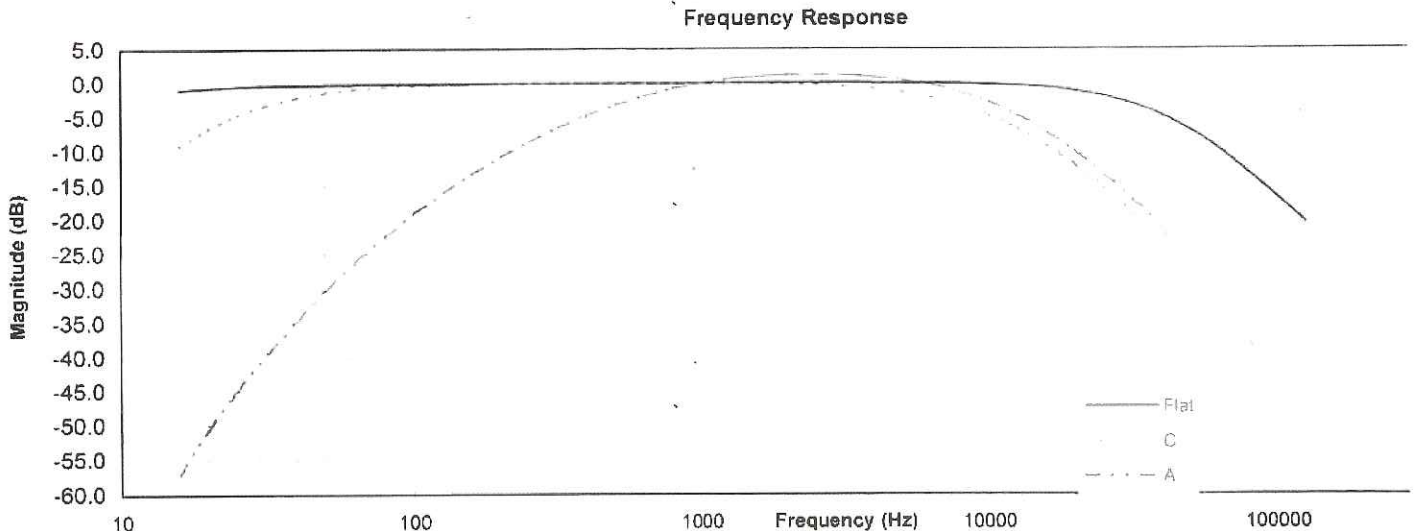
Serial No.: 01281440
 Serial No.: 76980

Company : Noise Control Engineering, Inc.


I.D. No.: RION 3

All tests:	Pass	Before data:	After data:
Reading with mic.:	Pass	Before & after data same:			
Level Accuracy:	Pass	Laboratory Environment:			
Meter linearity:	Pass	Ambient Temperature: 22.1 °C			
Attenuator accuracy:	Pass	Ambient Humidity: 36.5 % RH			
Frequency Response Cal:	Pass	Ambient Pressure: 98.891 kPa			
Frequency Response w/ Mic.:	Pass	Calibration Date: 18-Mar-2011 12:42 PM			
Inherent noise level:	Pass	Calibration Due: 18-Mar-2012			
Crest Factor:	Pass	Report Number: 20667 -1			
Time Constant:	Pass	Control Number: 20667			
Functions:	Pass				
Display & Batt. Check:	Pass				
Note: Sensitivity of supplied microphone, Model No.: UC-52 S/N: 59833, out of tolerance. Sensitivity of sound level meter adjusted to compensate for the low sensitivity of microphone. The above listed instrument meets or exceeds the manufacturer's specifications.					
This Calibration is traceable through NIST test numbers: 822/275722-08 The absolute uncertainty of calibration: 0.30dB at 95% confidence level. Unless otherwise noted, the reported values are both "as found" and "as left" data					

The curve is the response recorded with direct input.



The above listed instrument was checked using calibration procedure documented in West Caldwell Calibration Laboratories Inc. procedure : **Rev. 5.0 Sept. 10, 2010 Doc. # 1038 NL06RION**
 Calibration was performed by West Caldwell Calibration Laboratories Inc. under Operating Procedures intended to implement the requirements of ISO10012-1, IEC Guide 25, ANSI/NCSL Z540-1, (MIL-STD-45662A) and ISO 9001:2008, ISO 17025

Measurements performed by: 
Stephen Johnson

Calibrated on WCCL system type 9700

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Rev. 5.0 Sept. 10, 2010 Doc. # 1038 NL06RION

West Caldwell Calibration Laboratories Inc.

1575 State Route 96, Victor NY 14564
 Tel. (585) 586-3900 FAX (585) 586-4327

Calibration Data Record

Rion Calibrator

for
 Model No.: NC-73

Serial No.: 10417582

Company : Noise Control Engineering, Inc.

All tested parameters: Pass

Measured Sound Pressure Level (Six samples measured at 5 sec. interval)

Sample	1	94.01 dB re 20uPa	
	2	94.00	
	3	94.00	
	4	94.00	
	5	94.00	
	6	94.00	
Average		94.0 dB re 20uPa	Spec 94dB + - 1.0dB

Frequency measured (Three samples at 30 sec. Interval)

Sample	1	994.18 Hz	
	2	994.19	
	3	994.22	
Average		994.20 Hz	Spec. 1000Hz + - 2.0%

Distortion measured -54.6 dB Spec. <-40dB

Instruments used for calibration	Date of Cal.	Traceability No.	Re-cal Due Date
Brüel & Kjær 4228 S/N 1742061	1-Oct-2010	822/278767-10	2-Oct-2011
Brüel & Kjær 4231 S/N 2308998	6-Aug-2010	822/275722-08	6-Aug-2011
Brüel & Kjær 4134 S/N 173494	13-May-2010	822/275722-08	13-May-2011
Brüel & Kjær 2669 S/N 2148476	8-Nov-2010	822/275722-08	9-Nov-2011
HP 34401A S/N 3146A223	27-Jul-2010	,205342	27-Jul-2011
Brüel & Kjær 2636 S/N 1107902	27-Jul-2010	822/275722-08	27-Jul-2011
HP 33120A S/N US360458	27-Jul-2010	,205342	27-Jul-2011

Cal. Date: 18-Mar-2011 2:45 PM

Tested by: Stephen Johnson

Calibrated on WCCL system type 9700

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Rev. 5.0 Sept. 10, 2010 Doc. # 1038 NC73RION

West Caldwell Calibration Laboratories, Inc.
 uncompromised calibration
 1575 State Route 96, Victor NY 14564



REPORT OF CALIBRATION

Quest Technologies Calibrator
 Company : Noise Control Engineering, Inc.

Model No.: QC-10

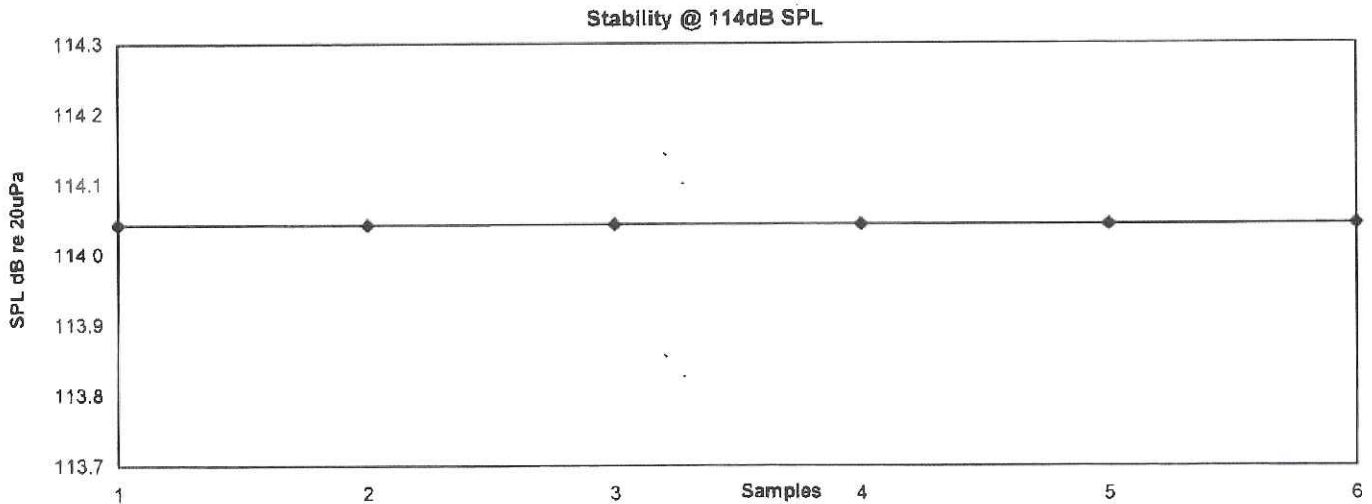
Serial No.: QE2100040

I. D. No: XXXX

Calibration results:		Before data:	After data: <input checked="" type="checkbox"/>
Sound Pressure Level at 1010.2 Hz and pressure of 1013 hPa (mbar) was 114.04 dB re 20uPa		Before & after data same:	
		Laboratory Environment	
Sound Pressure Level:	Pass	Ambient Temperature	22.1 °C
Frequency:	Pass	Ambient Humidity	36.5 % RH
Distortion:	Pass	Ambient Pressure:	98.891 kPa
Stability:	Pass	Calibration Date	18-Mar-2011 2:21 PM
AC output	Pass	Re-calibration Due	18-Mar-2012
All tested parameters:	Pass	Report Number:	20667 -4
		Control Number:	20667

The above listed instrument meets or exceeds the tested manufacturer's specifications.
 The IEC 60942:1988 Class 1 specifications, passed.
 The ANSI S1.40-1984 specifications, passed.

This Calibration is traceable through NIST test numbers: 822/275722-08
 The expanded uncertainty of calibration: 0.18dB at 95% confidence level with a coverage factor of k=2.
 Graph represents six samples of Sound Pressure Level measured at 5sec. interval



The above listed instrument was checked using calibration procedure documented in West Caldwell Calibration Laboratories Inc. procedure : **Rev. 5.0 Sept. 10, 2010 Doc. # 1038 QC10QUES**
 Calibration was performed by West Caldwell Calibration Laboratories Inc. under Operating Procedures intended to implement the requirements of ISO10012-1, IEC Guide 25, ANSI/NCSS Z540-1, (MIL-STD-45662A) and ISO 9001:2008, ISO 17025

Cal. Date: 18-Mar-2011 2:21 PM
 Calibrated on WCCL system type 9700

Measurements performed by Stephen Johnson

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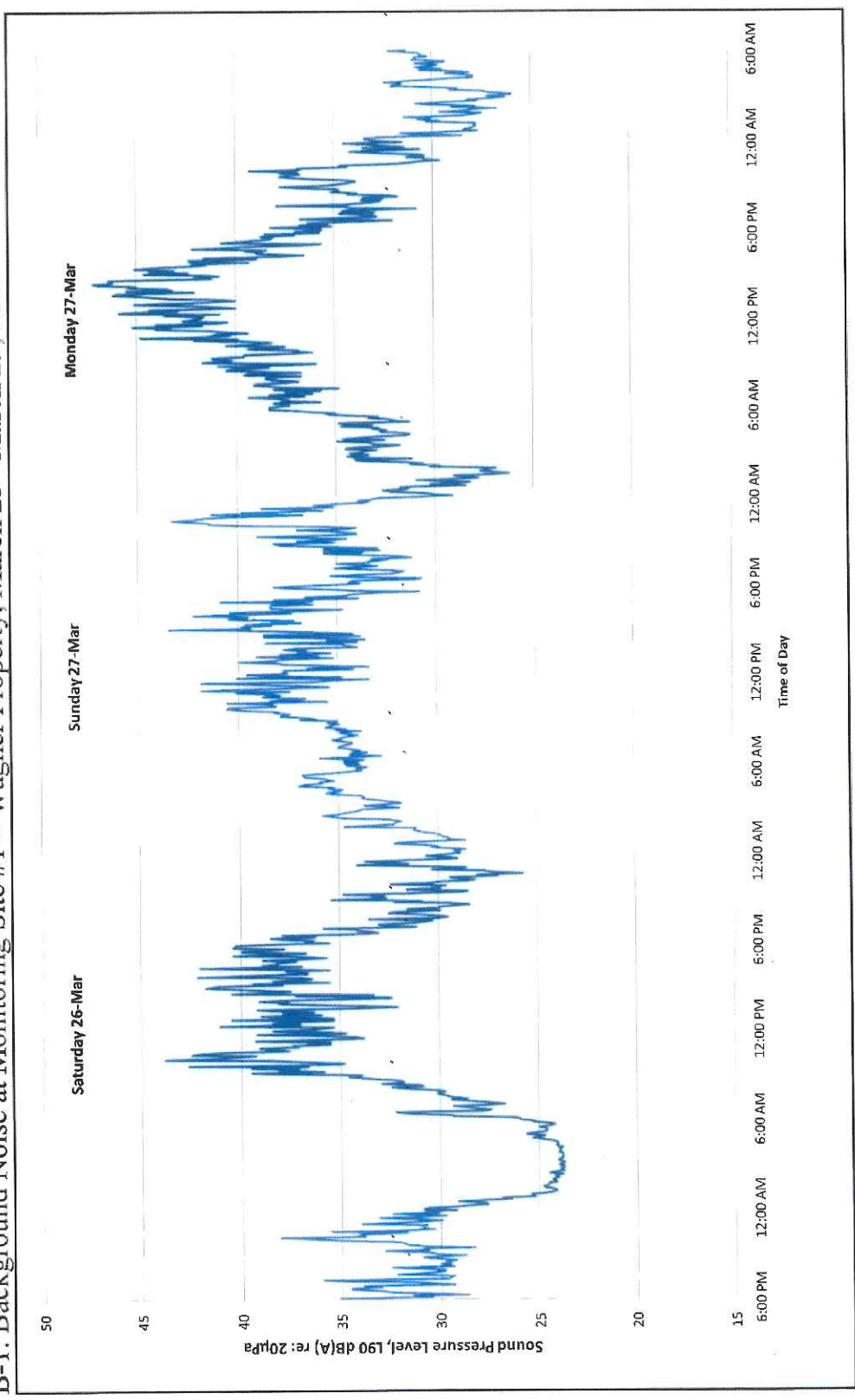
Rev. 5.0 Sept. 10, 2010 Doc. # 1038 QC10QUES

APPENDIX B:

Continuous Sound Pressure Level Measurements

TM 2011-014
Noise Control Engineering, Inc.
Colebrook Wind Turbine Background Noise

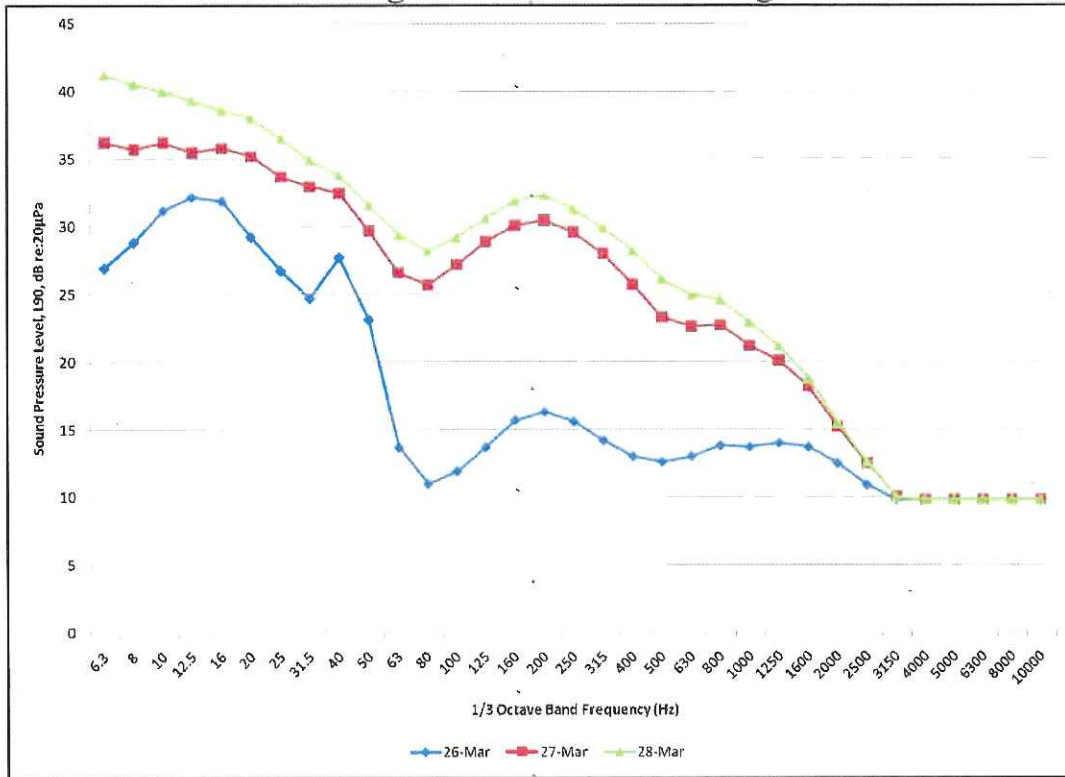
B-1: Background Noise at Monitoring Site #1 -- Wagner Property, March 25 -- March 29, 2011



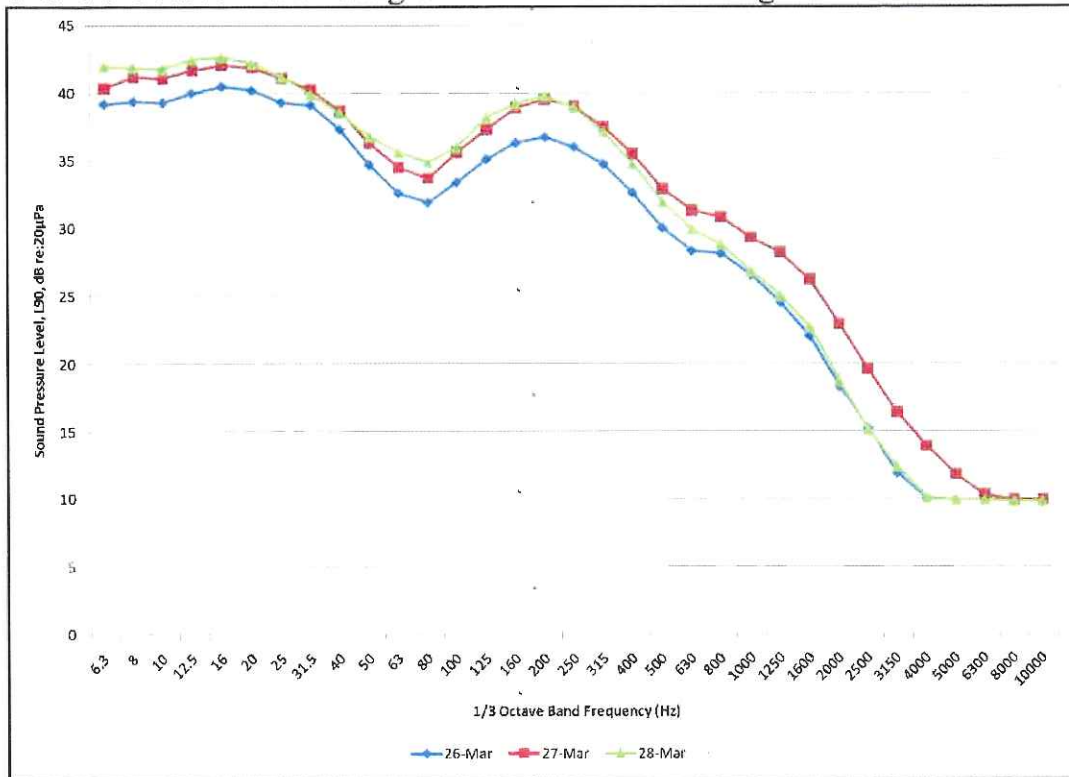
APPENDIX C:

One-Third Octave Band Sound Pressure Level Measurements

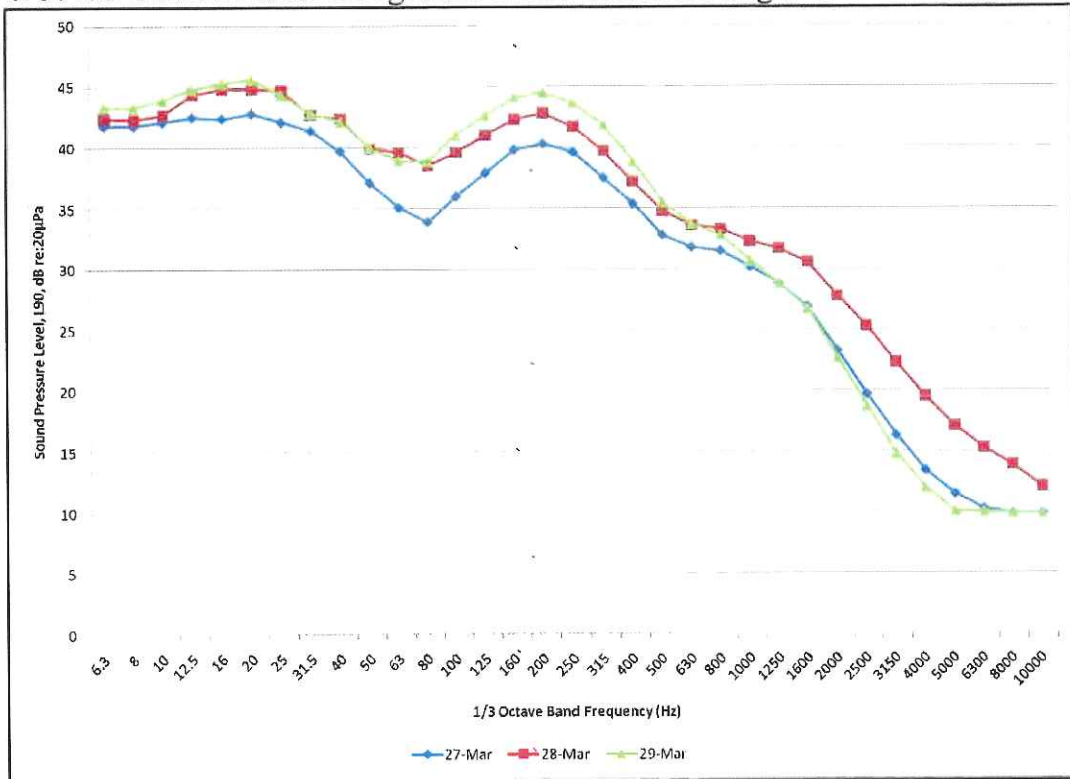
C-1: 1/3 Octave Band Background Noise at Monitoring Site #1 – 3AM



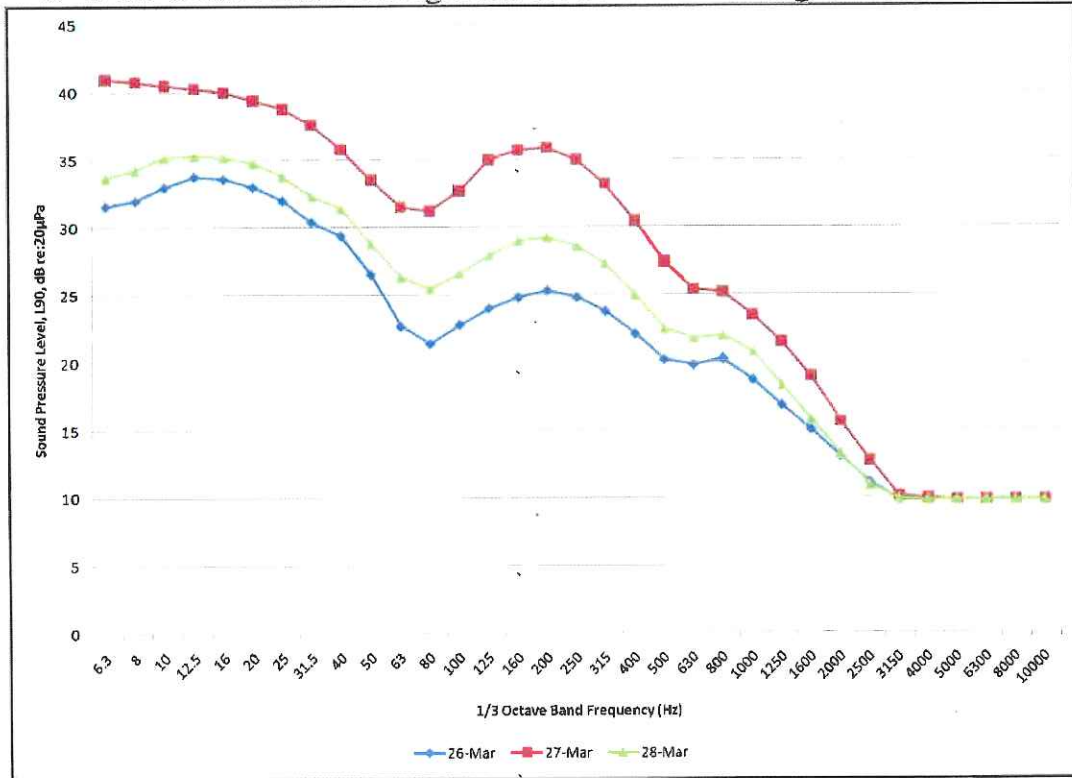
C-2: 1/3 Octave Band Background Noise at Monitoring Site #1 – 11am



C-3: 1/3 Octave Band Background Noise at Monitoring Site #1 – 3PM



C-4: 1/3 Octave Band Background Noise at Monitoring Site #1 – 11PM




CERTIFICATION

I hereby certify that a copy of the foregoing document was delivered by first-class mail
and e-mail to the following service list on the 19th day of April, 2011:

Carrie L. Larson
Paul Corey
Jeffery and Mary Stauffer
Thomas D. McKeon
David M. Cusick
Richard T. Roznoy
David R. Lawrence and Jeannie Lemelin
Walter Zima and Brandy L. Grant
Eva Villanova

and sent via e-mail only to:

John R. Morissette
Christopher R. Bernard
Joaquina Borges King



Nicholas J. Harding