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Turbine T19 ACOUSTIC REPORT

Grand Bend Wind Farm

Grand Bend, Ontario

Report Number: 02.0031.003

Project Number: 02.0031

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November 29, 2016

Template QF 510-01 V05

VERSION CONTROL

Version	Date	Version Description
01	November 29, 2016	Original Report

EXECUTIVE SUMMARY

Howe Gastmeier Chapnik Limited ("HGC Engineering") was retained by Northland Power Inc., on behalf of Grand Bend Wind Limited Partnership, to complete an Acoustic Noise test in accordance with IEC 61400-11 of Wind Turbine Generator ("WTG") T19, part of the Grand Bend Wind Farm near Grand Bend, Ontario. The measurements were completed on October 24, 2016.

HGC Engineering has assessed the acoustic emissions of WTG T19, a Siemens SWT 3.0-113 wind turbine rated at 2483 kW, in accordance with CAN/CSA-C61400-11:13 (IEC 61400-11:2012). A summary of the acoustic results are provided in the following table:

Hub Height Wind Speed [m/s]	**7.5**	**8**	**8.5**	**9**	**9.5**	**10**	**10.5**	**11**	**11.5**	**12**
Sound Power Level $L_{WA,k}$ in dB(A):	**100.8**	**101.0**	**101.0**	**101.0**	**100.9**	**100.8**	**100.8**	**101.0**	**101.0**	**100.8**
Tonal Audibility, ΔL_{ak} in dB:	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0
Total Uncertainty $u_{LWA,k}$ in dB:	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8

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1 INTRODUCTION

Howe Gastmeier Chapnik Limited ("HGC Engineering") was retained by Northland Power Inc., on behalf of Grand Bend Wind Limited Partnership, to complete sound level measurements (Emission Audit) of Wind Turbine Generator ("WTG") T19 in order to determine the sound power level of the turbine. The turbine is part of the Grand Bend Wind Farm which includes 40 Siemens turbines, with an overall project nameplate capacity of 100 MW. Measurements were completed on October 24, 2016 between 12:00 and 19:00. Figure 1 shows the location of the WTG T19.

This report summarizes measurements that were completed in accordance with IEC Standard 61400-11 "Wind turbine generator systems – Part 11: Acoustic Noise Measurement Techniques". The CAN/CSA-C61400-11:13 standard is an adoption without modification of the identically titled IEC Standard IEC 61400-11:2012 [1].

1.1 DEVIATIONS FROM IEC 61400-11

Data for the turbine electrical power, nacelle wind speed, rotor RPM, and azimuth position were obtained from the data collection system of the wind turbine. The calibration status of the nacelle anemometer and the electrical power transducer are unknown.

2 WIND TURBINE GENERATOR

The wind turbine generator is manufactured by Siemens and is a SWT 3.0-113 rated at 2483 kW with a rotor diameter of 113 m and a hub height of 99.5 m. This turbine is an upwind, pitch controlled, horizontal axis wind turbine with three blades. Specific details of the wind turbine generator are included in Table 1.

Table 1: Wind Turbine Generator Characteristics

Wind Turbine	
Manufacturer	Siemens
Model Number	SWT 3.0-113
Serial Number	3000962
Hub Height	99.5 m
Tower Type (lattice or tube)	Tubular
Horizontal Distance from Rotor Centre to Tower Axis	5.5 m
Rotor Diameter	113 m
Speed (constant or variable)	Variable
Pitch Angle	Confidential
Rotational Speed	Max speed, 12 rpm
Rated Power Output	2483 kW
Control Software Version	128.2.0.1
Rotor Details	
Rotor Control Devices	Pitch control
Presence of Vortex Generators, Stall Strips Trailing Edges	Vortex generators and Dino Tails
Blade Type	B55
Serial Number	Blade A: 550337401 Blade B: 550335201 Blade C: 550336701
Gearbox	
Manufacturer	N/A Direct drive
Model Number	N/A Direct drive
Serial Number	N/A Direct drive
Generator	
Manufacturer	Siemens
Model Number	DD22_02
Serial Number	5100151551

The power curve utilized for the sound level measurements is shown in Figure 2. From the supplied power curve, 85% of maximum electrical power is reached at 2111 kW or at a hub height wind speed of 9.3 m/s. The required minimum wind speeds for reporting is from 0.8 to 1.3 times the wind speed

at 85% electrical power which is from 7.5 to 12 m/s for this wind turbine. The sound level specifications for this turbine indicates a maximum sound power level of 101.5 dBA.

3 TEST ENVIRONMENT

WTG T19 is part of the Grand Bend Wind Farm located near Grand Bend, Ontario. Figure 1 shows the specific location of WTG T19. The surrounding land is used mainly for agricultural crops and includes gently rolling terrain. The sound level measurement location was in a recently harvested soybean field.

There are a number of additional wind turbine generators located in the vicinity of the test turbine. WTG T20 is located approximately 650 m to the east, with additional turbines located more than 2300 m away. The surrounding wind turbine (T20), part of the Grand Bend Wind Farm, was parked during the testing of WTG T19.

The sound level measurement location was established at 140 m from the base of the turbine. This distance was determined utilizing the reference distance calculation provided in IEC 61400; $R_0 = H + D/2 \pm 20\%$ where H is the hub height and D is the rotor diameter. An R1 distance of 178 m was determined for this test. Photos of the sound level measurement location, the test turbine and wind mast location are included under Appendix A.

4 INSTRUMENTATION AND SETUP

A Wolfel RoBin measurement system was utilized to complete the IEC measurements. Sound pressure level measurements and recordings were completed utilizing a 01 dB DUO Smart Noise Monitor. The microphone was mounted on a one metre diameter board with a primary and secondary windscreen. A standard Bruel & Kjaer 3” wind screen (half) was used on the microphone as well as a secondary Bruel & Kjaer UA-2133 wind screen. The influence of the secondary windscreen is shown in Table 2. The measured sound levels have been adjusted for the acoustic influence of the secondary windscreen which contributes less than 0.2 dBA to the overall sound level.

Table 2: Frequency Dependent Influence for UA-2133 Windscreen

Frequency [Hz]	SPL Influence [dB]	Frequency [Hz]	SPL Influence [dB]
100	-0.07	1600	-0.3
125	0.06	2000	-0.03
160	0.01	2500	-0.12
200	0.18	3150	-0.25
250	-0.03	4000	-0.73
315	-0.25	5000	-0.5
400	-0.26	6300	-0.03
500	-0.18	8000	-0.99
630	0.04	10000	-0.77
800	-0.14	12500	-0.75
1000	-0.44	16000	-1.23
1250	-0.14	20000	-0.59

The RoBin and DUO systems were time synchronized with the data collection of the wind turbine generator prior to the start of the measurements (within 1 second).

For the measurements, the electrical power, rotor RPM, hub height wind speeds and nacelle azimuth were provided by the customer as analogue signals and were directly connected to the RoBin system.

Wind speed and direction at 10 m height were measured utilizing a Vaisala ultrasonic anemometer, while a Reinhardt DFT485 sensor was utilized to measure air pressure, temperature and air humidity. Table 3 shows the weather conditions during the measurement period.

Table 3: Weather Conditions

	Beginning of Test	End of Test
Air Temperature (°C)	8	8
Air Pressure (hPa)	996	997
Sky Condition	Overcast	Overcast
Range of Wind Direction (°)	320 to 350	

Table 4 shows the measurement equipment and the relevant calibration information for the test date.

Table 4: Instrumentation, October 24, 2016

Instrumentation	Manufacturer / Model / Serial Number	Calibration Date
Measurement System	Wolfel / RoBin / ROBIN.00.0003	NA
Sound Level Meter	01 dB-Metravib / DUO / 10815	29-Feb-2016
Microphone	GRAS / 40CD / 154426	29-Feb-2016
Temperature/Pressure	Reinhardt / DFT 485 / 1027951V1.13	16-Sep-2015
Ultrasonic Wind Sensor	Vaisala / WMT701 / J390012	30-Sep-2015
Acoustic Calibrator	Bruel & Kjaer / 4231 / 3010241	23-Feb-2016
Primary Wind Screen	Bruel & Kjaer	NA
Secondary Wind Screen	Bruel & Kjaer / UA 2133	NA
Noisy Software	Wolfel / Noisy Version 2015-2 / S007/00062	NA
Laser Range Finder	TruPulse / 200 / 75117	24-Nov-2014

Correct calibration of the acoustic instrumentation was verified using an acoustic calibrator manufactured by Brüel & Kjær. Verification of calibration status was carried out at the start and end of the measurement period and when the microphone was disconnected from the sound level meter. Calibration certificates for the test equipment can be provided upon request. Unless indicated otherwise, the same equipment was utilized during the entire test period.

For testing on October 24, 2016, the anemometer was located 140 m east of the turbine at 10 m above grade. The standard roughness length applicable for this site is 0.05 given the surrounding farmland with some vegetation.

Sound level measurements were completed with the turbine operational (on) and with the turbine parked (off). Significant interfering sound from road traffic, aircraft, bird calls, local agricultural activity, etc. was not included in the analyzed data for either the turbine on or off condition. Additionally, sound level measurements from when the nacelle direction deviated more than +/- 15° from the downwind direction for the reference microphone position was not included in the analysis. Downwind direction ranged between 320 and 350 degrees.

4.1 TYPE B UNCERTAINTIES

The uncertainty components of Type B are provided in Table 5. Additional one-third octave Type B uncertainty components for the instrument and wind screen insertion loss can be provided upon request. These uncertainty components are provided by the instrument manufacturers.

Table 5: Type B Uncertainty Components

Component	Value [dB]
Calibration, u_{B1}	0.2
Instrument, u_{B2}	0.2 - 0.5
Board, u_{B3}	0.3
Wind screen insertion loss, u_{B4}	0.1 - 0.5
Distance and Direction, u_{B5}	0.1
Air Absorption, u_{B6}	0.2
Weather Conditions, u_{B7}	0.5
Wind Speed, Measured, u_{B8}	0.7
Wind Speed Derived, u_{B8}	0.2
Wind Speed, Power Curve, u_{B9}	0.2

5 MEASUREMENTS AND RESULTS

Sound level measurements were conducted of WTG T19 on October 24, 2016 between 12:00 and 19:00. Temperature and other weather characteristics are reported in Table 3 above.

The data points where the turbine was operating at or below the allowed power curve range are identified as the allowed range (intervals on the electrical power curve where no duplicated values exist and the slope of the power curve including the uncertainty is positive). For data within the allowed range of the electrical power curve the wind speed is determined from the power curve, while data points outside the allowed range are determined utilizing the nacelle anemometer method. The reference electrical power curve is provided as Figure 2.

Figure 3 shows the sound pressure level at the measurement location versus the hub height wind speed. Blue circles represent sound level data points collected with the turbine operating in the allowed range, above this point the sound levels are shown as black squares. Magenta triangles indicate data points of the background sound level (turbine off).

Figure 4 shows the measured total sound versus electrical power, while Figure 5 shows the wind speed derived from the power curve relative to the nacelle wind speed and 10 m height wind speed.

Observations in the vicinity of the measurement location indicated that the wind turbine was not tonal and aerodynamic noise from the rotating blades dominated the sound levels.

Table 6 summarizes the analysis of the measured results with and without the turbine operational.

Table 6: Sound Level Data of WTG T19

Hub Height Wind Speed [m/s]	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12
Collected Data Points, Total	16	16	15	24	51	62	56	75	115	84
Collected Data Points, Background	15	11	21	23	27	31	27	32	29	31
Average Wind Speed, V_K [m/s]	7.5	8.1	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0
Total Noise, $L_{V,T,}$ in dB(A)	51.0	51.2	51.2	51.3	51.2	51.1	51.2	51.2	51.2	51.2
Background Noise, $L_{V,B}$ in dB(A)	36.8	37.2	37.5	38.5	39.2	39.4	39.9	39.3	39.5	39.9
Difference T-B, dB(A)	14.2	14.0	13.7	12.7	12.0	11.7	11.2	11.9	11.8	11.3
Corrected L_{Aeq}, in dB(A)	50.8	51.0	51.0	51.0	50.9	50.8	50.8	50.9	51.0	50.8

Table 6 shows that at least 180 measurements were collected for both total noise and background noise and at least 10 measurements are included in the analysis for each wind speed bin for both total noise and background noise, as required by IEC 61400-11.

Table 7 shows the calculated sound level data, the resulting sound power levels, tonality and measurement uncertainty at hub height, while Table 8 shows the apparent sound power levels at a reference height of 10 m. Figure 6 presents the apparent sound power level at the hub height wind speeds.

Table 7: Apparent Sound Power Level of WTG T19 at Hub Height

Hub Height Wind Speed [m/s]	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12
Corrected L_{Aeq}, in dB(A)	50.8	51.0	51.0	51.0	50.9	50.8	50.8	50.9	51.0	50.8
Sound Power Level $L_{WA,K}$ in dB(A)	**100.8**	**101.0**	**101.0**	**101.0**	**100.9**	**100.8**	**100.8**	**101.0**	**101.0**	**100.8**
Tonal Audibility, ΔL_{ak} in dB:	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0
Total Uncertainty $u_{LWA,k}$ in dB:	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8

Table 8: Apparent Sound Power Level of WTG T19 at 10 m Height

10m Height Wind Speed [m/s]	6	7	8	9
Theoretical active power in kW:	2482	2483	2483	2483
Sound Power Level $L_{WA,k}$ in dB(A):	**101.0**	**100.8**	**101.0**	**[99.6]**
Total Uncertainty $u_{LWA,k}$ in dB:	0.5	0.7	0.6	0.7

[ ] insufficient data

A table and plot of the sound power spectrum in one-third octaves for each hub height wind speed are included under Appendix B.

The tonality assessment indicates no tonal audibility greater than -3 dB. Therefore, no relevant tones were found for any of the measured wind speeds. Tonality assessment details for all wind speed bins are included under Appendix C.

6 CONCLUSIONS

The measurements and analysis, performed in accordance with the methods prescribed in IEC Standard 61400-11:2012 indicate that the sound power level of WTG T19, a Siemens SWT 3.0-113 wind turbine, rated at 2483 kW, has the following sound power levels:

Hub Height Wind Speed [m/s]	**7.5**	**8**	**8.5**	**9**	**9.5**	**10**	**10.5**	**11**	**11.5**	**12**
Sound Power Level $L_{WA,k}$ in dB(A):	**100.8**	**101.0**	**101.0**	**101.0**	**100.9**	**100.8**	**100.8**	**101.0**	**101.0**	**100.8**
Tonal Audibility, ΔL_{ak} in dB:	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0
Total Uncertainty $u_{LWA,k}$ in dB:	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8

The sound levels presented above are relevant for WTG T19 given the environmental conditions and the operating parameters of the turbine during the testing periods.

7 RECOMMENDATIONS / OPINIONS

The results of the acoustic measurements and analysis indicate that, for all measured wind speeds, Wind Turbine Generator T19, part of the Grand Bend Wind Farm, does not exceed the specified maximum sound power level of 101.5 dBA.

REFERENCES

1. International Electrotechnical Commission, 61400-11:2012 *Wind turbine generator systems – Part 11: Acoustic noise measurement techniques.*
2. Google Maps Aerial Imagery, Internet Application: *maps.google.com*

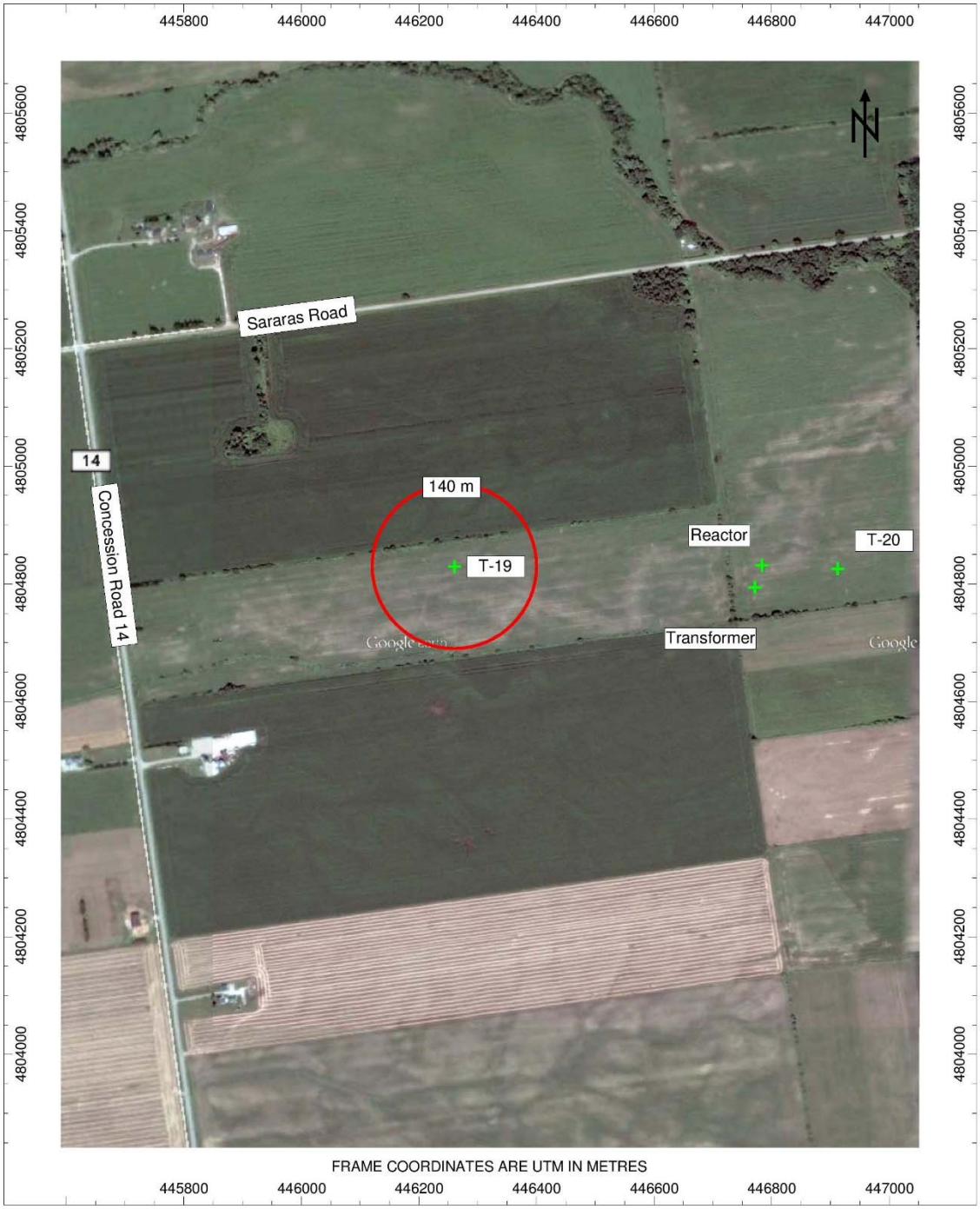


Figure 1: Location of Test Turbine

Figure 2: Reference Electrical Power Curve
WTG T19, 2483 kW, Grand Bend Wind Farm

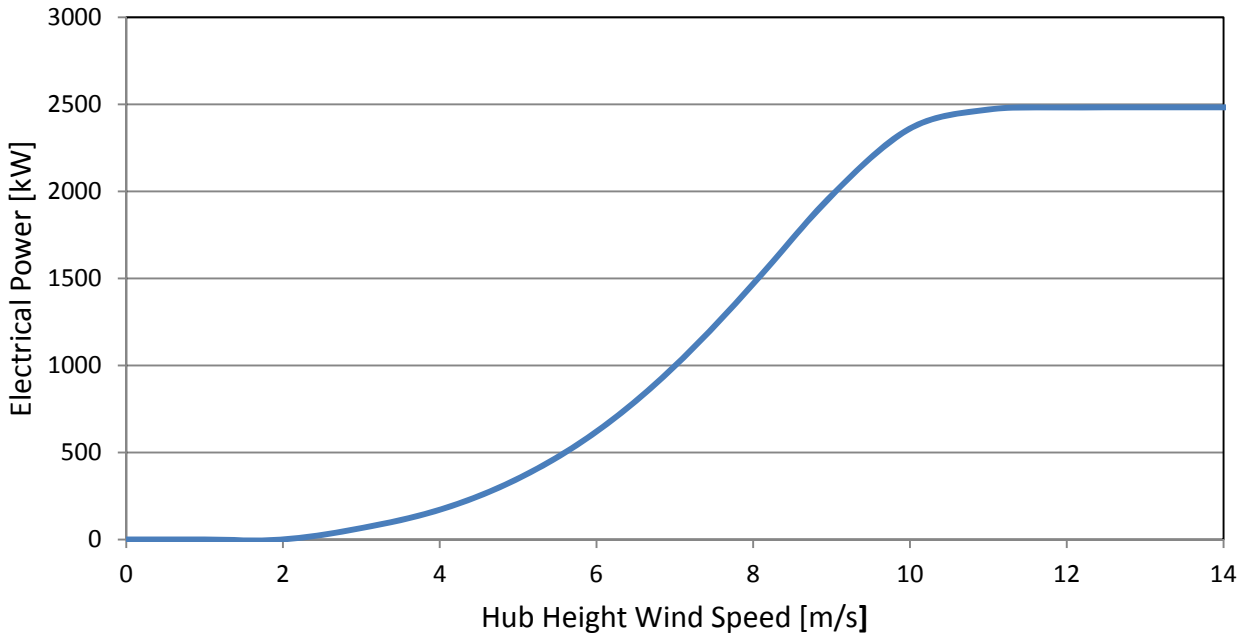


Figure 3: Acoustic Noise Measurements of Wind Turbine
WTG T19, 2483 kW, Grand Bend Wind Farm

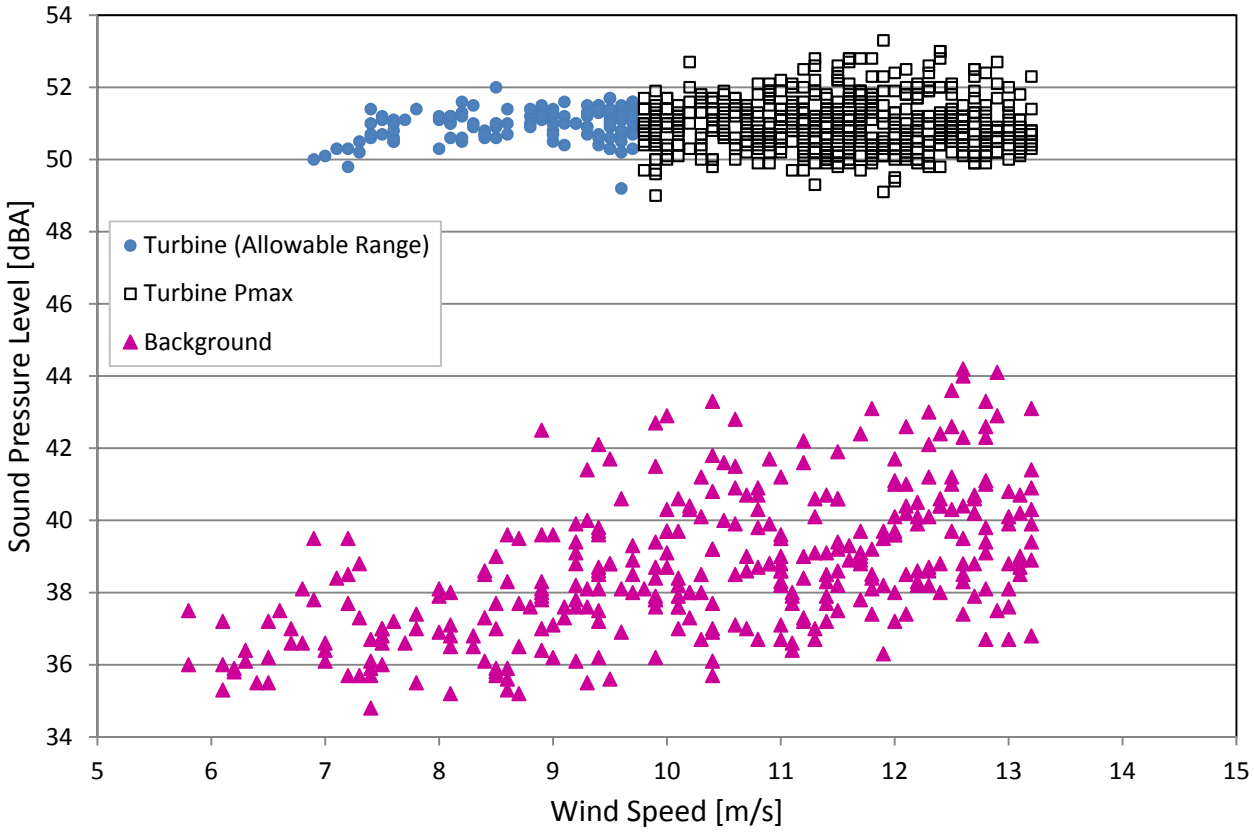


Figure 4: Total Sound Level [dBA] versus Electrical Power [kW]
WTG T19, 2483 kW, Grand Bend Wind Farm

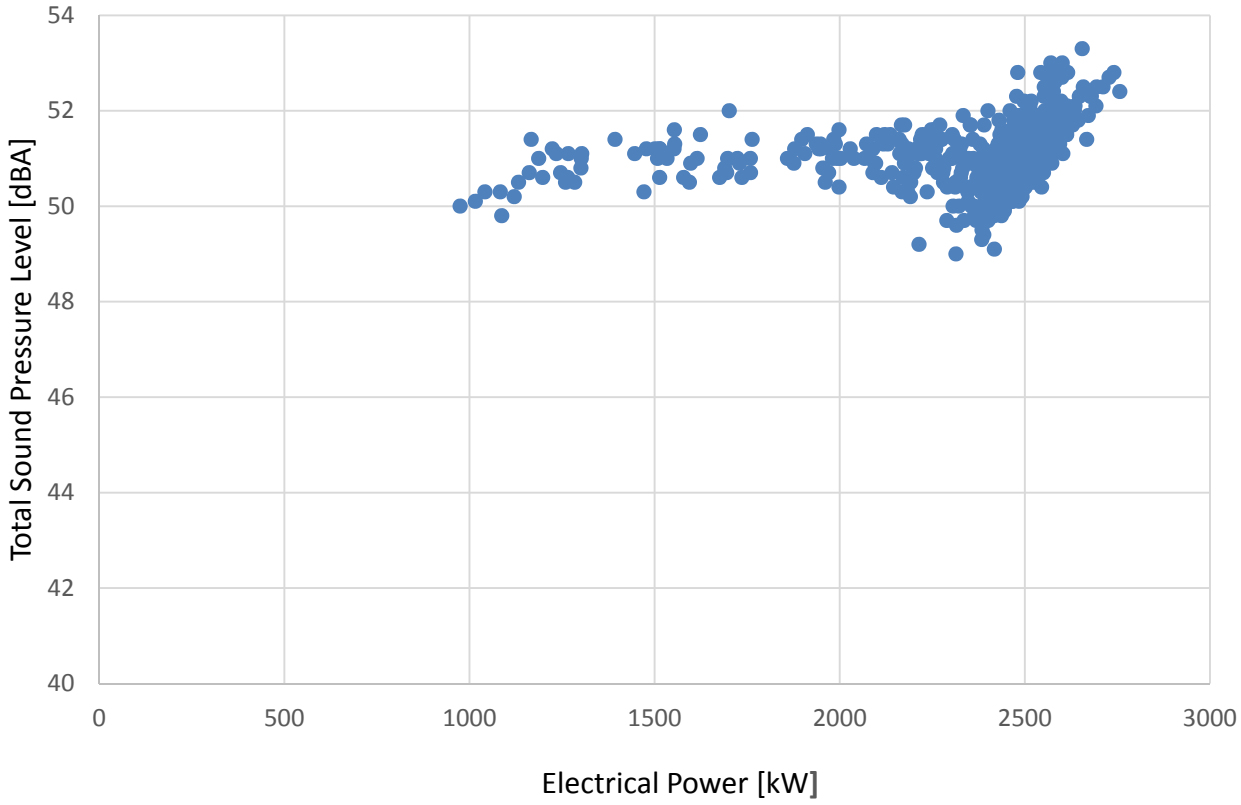


Figure 5: Measured Wind Speed vs Derived Wind Speed
WTG T19, 2483 kW, Grand Bend Wind Farm

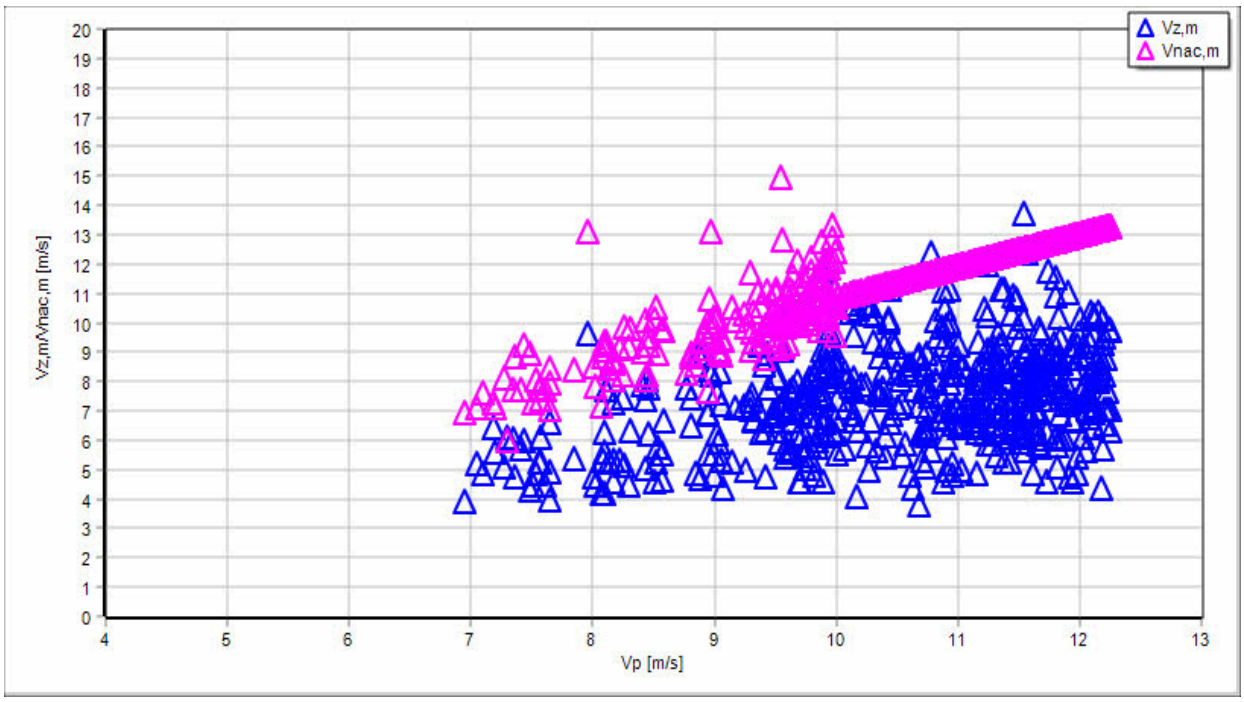
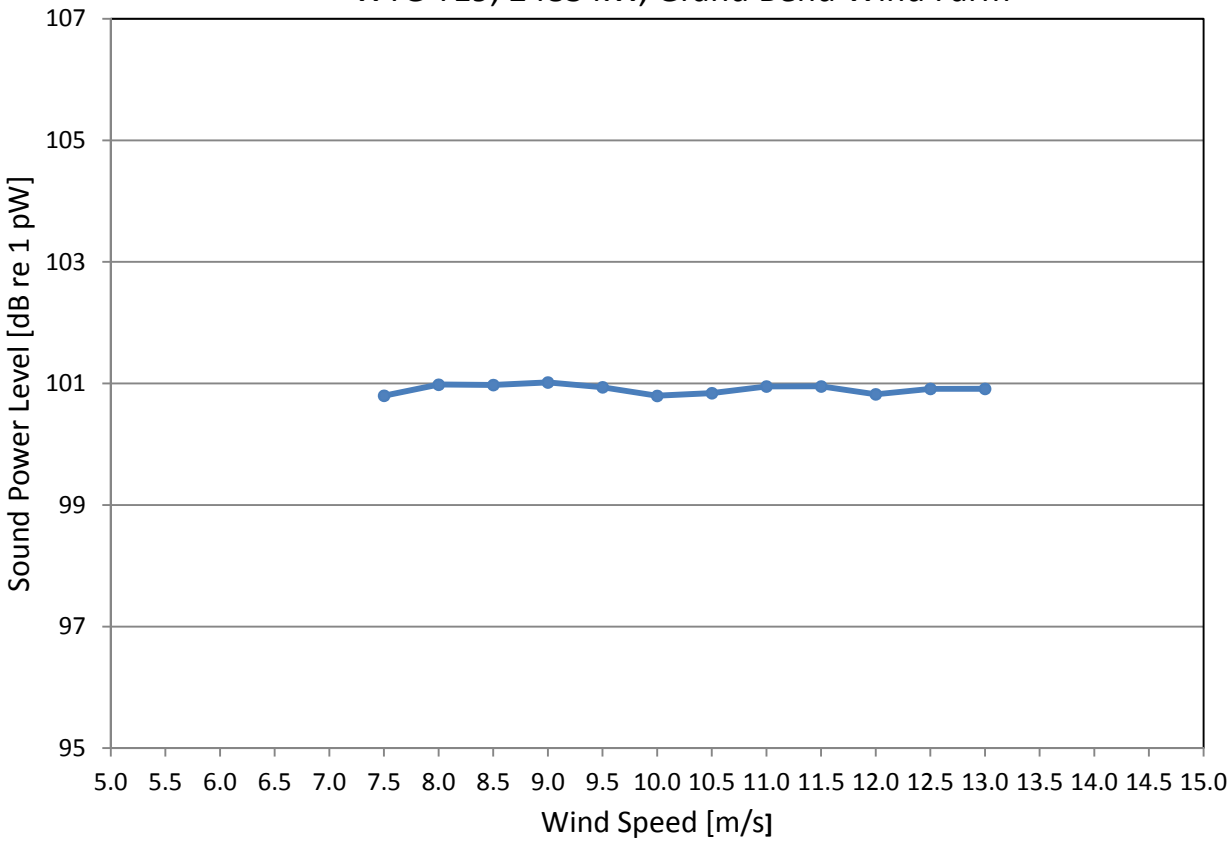


Figure 6: Apparent Sound Power Level at Hub Height Wind Speeds
WTG T19, 2483 kW, Grand Bend Wind Farm



APPENDIX A:
LOCATION PHOTOS

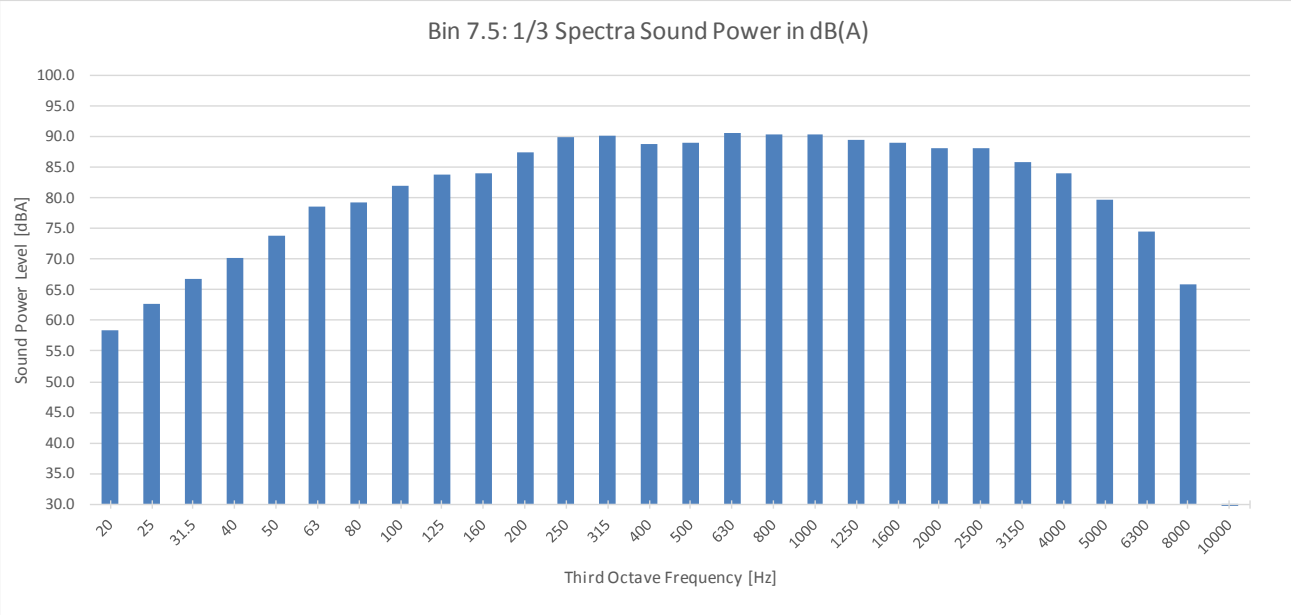
Wind Mast Location, October 24, 2016

Sound Level Measurement Location, October 24, 2016

Sound Level Microphone on Board, October 24, 2016

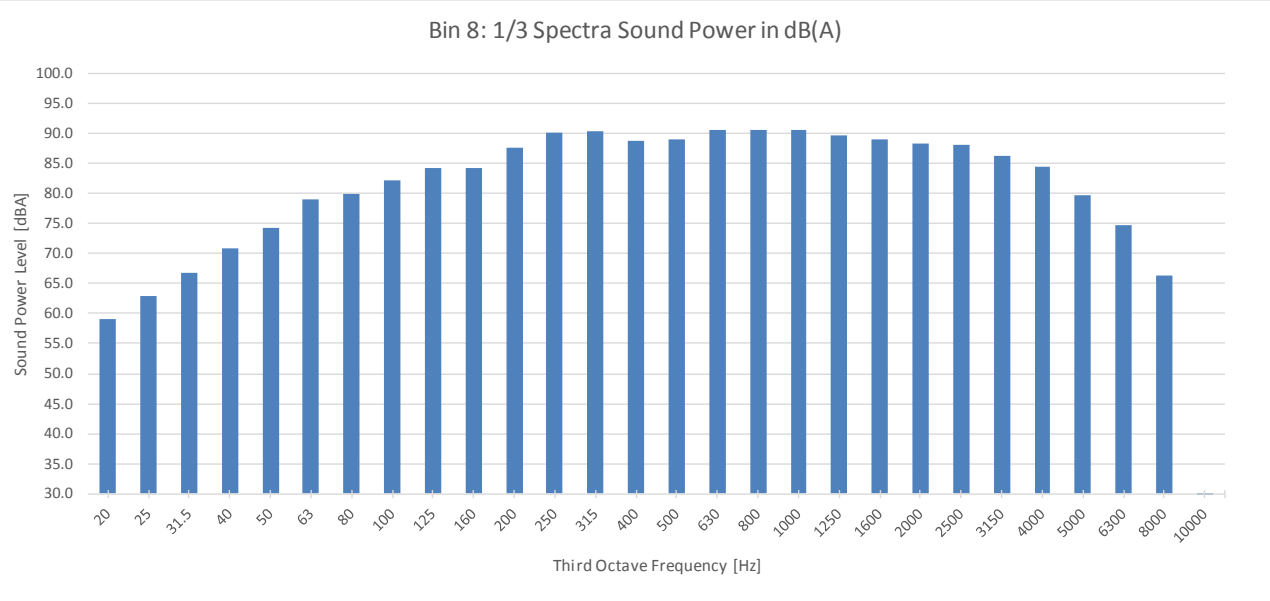
APPENDIX B:

OCTAVE BAND SOUND LEVEL RESULTS



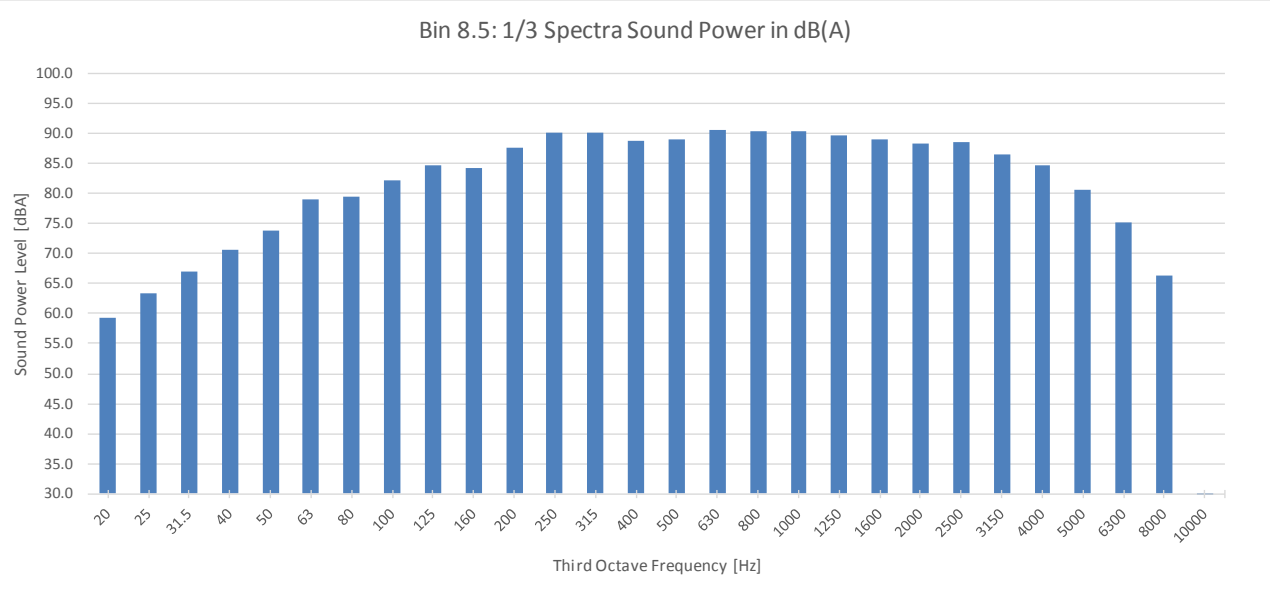
Bin 7.5: 1/3 Spectra Sound Power in dB(A)														
Frequency[Hz]	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400
Laeq	58.4	62.6	66.9	70.3	73.9	78.6	79.3	81.9	83.7	84.1	87.4	90.0	90.2	88.7
U_C	1.0	1.1	1.1	1.1	1.0	0.9	1.0	0.8	0.8	0.7	0.8	0.7	0.7	0.7
Frequency[Hz]	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
Laeq	89.1	90.7	90.3	90.3	89.5	88.9	88.0	88.0	85.9	84.1	79.8	74.4	65.8	[55.5]
U_C	0.8	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.0	1.2	1.8

[ ] Total Noise less than 3 dB greater than background (3 dB correction applied).



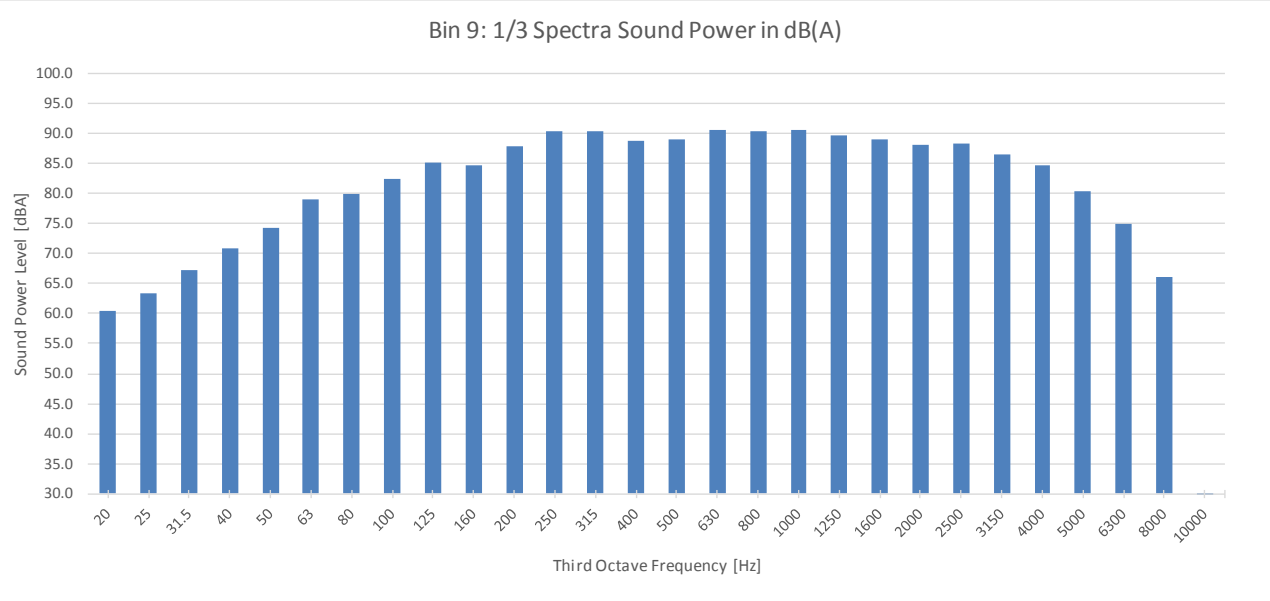
Bin 8: 1/3 Spectra Sound Power in dB(A)														
Frequency[Hz]	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400
Laeq	59.0	63.0	66.9	70.8	74.2	79.1	79.9	82.2	84.3	84.3	87.6	90.2	90.3	88.7
U_c	0.9	1.0	1.0	1.0	0.9	0.8	0.8	0.7	0.7	0.6	0.7	0.6	0.6	0.6
Frequency[Hz]	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
Laeq	89.1	90.7	90.5	90.6	89.7	89.1	88.3	88.2	86.3	84.4	79.6	74.8	66.3	[56]
U_c	0.7	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	1.1	0.9	1.0	1.7

[ ] Total Noise less than 3 dB greater than background (3 dB correction applied).



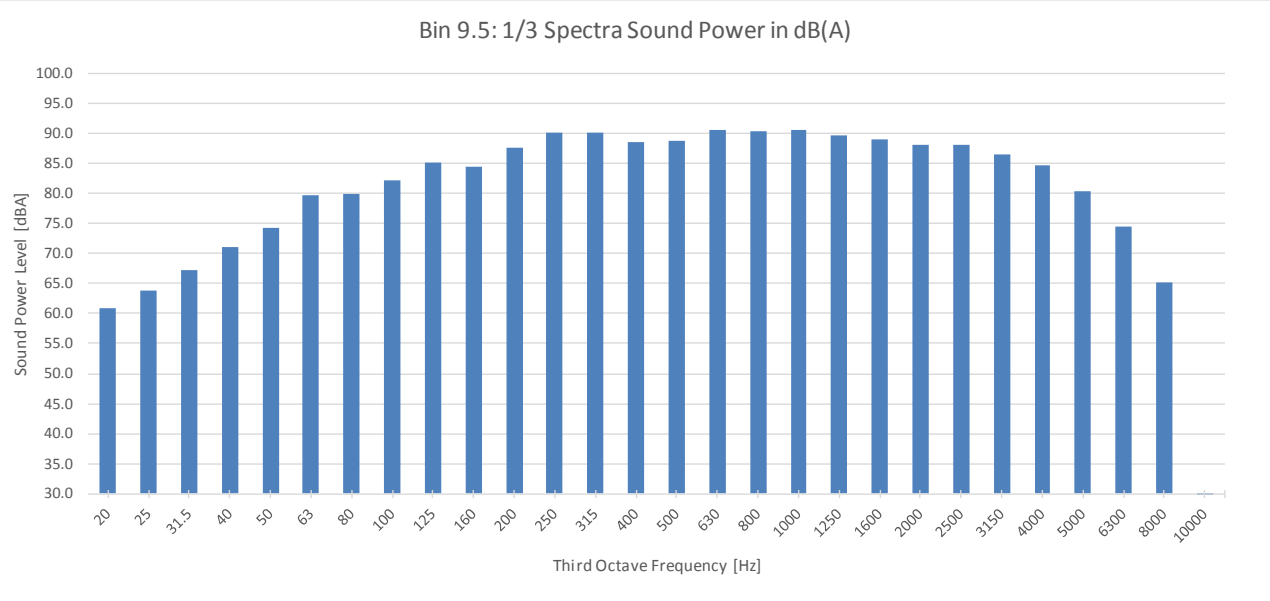
Bin 8.5: 1/3 Spectra Sound Power in dB(A)														
Frequency[Hz]	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400
Laeq	59.4	63.3	67.0	70.6	73.8	79.0	79.5	82.1	84.7	84.3	87.6	90.1	90.2	88.7
U_c	0.9	1.0	1.0	1.0	1.0	0.9	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Frequency[Hz]	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
Laeq	89.0	90.7	90.3	90.4	89.6	89.1	88.4	88.6	86.6	84.8	80.6	75.1	66.3	[56.1]
U_c	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.9	1.0	1.1	1.7

[ ] Total Noise less than 3 dB greater than background (3 dB correction applied).



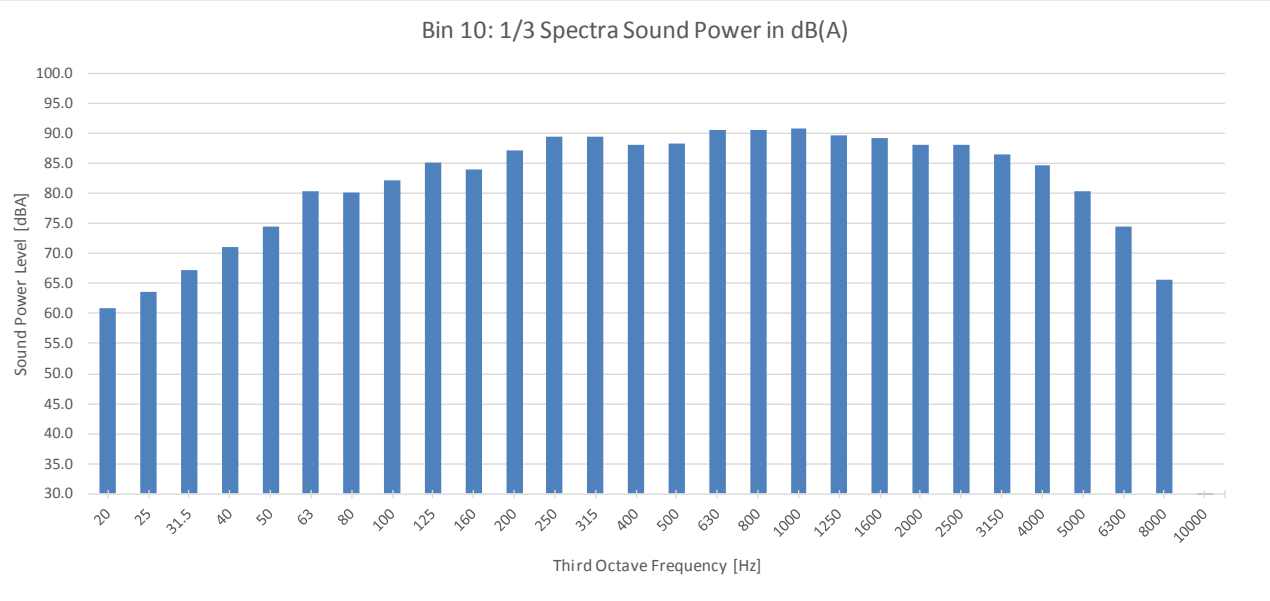
Bin 9: 1/3 Spectra Sound Power in dB(A)														
Frequency[Hz]	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400
Laeq	60.5	63.3	67.2	70.9	74.3	79.0	79.9	82.4	85.1	84.6	87.8	90.3	90.3	88.7
U_c	0.9	1.0	1.1	1.0	1.0	0.9	0.9	0.8	0.7	0.7	0.8	0.7	0.7	0.7
Frequency[Hz]	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
Laeq	88.9	90.7	90.4	90.6	89.6	89.0	88.2	88.3	86.6	84.7	80.5	74.9	66.1	[56.6]
U_c	0.8	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.1	1.3	1.8

[ ] Total Noise less than 3 dB greater than background (3 dB correction applied).



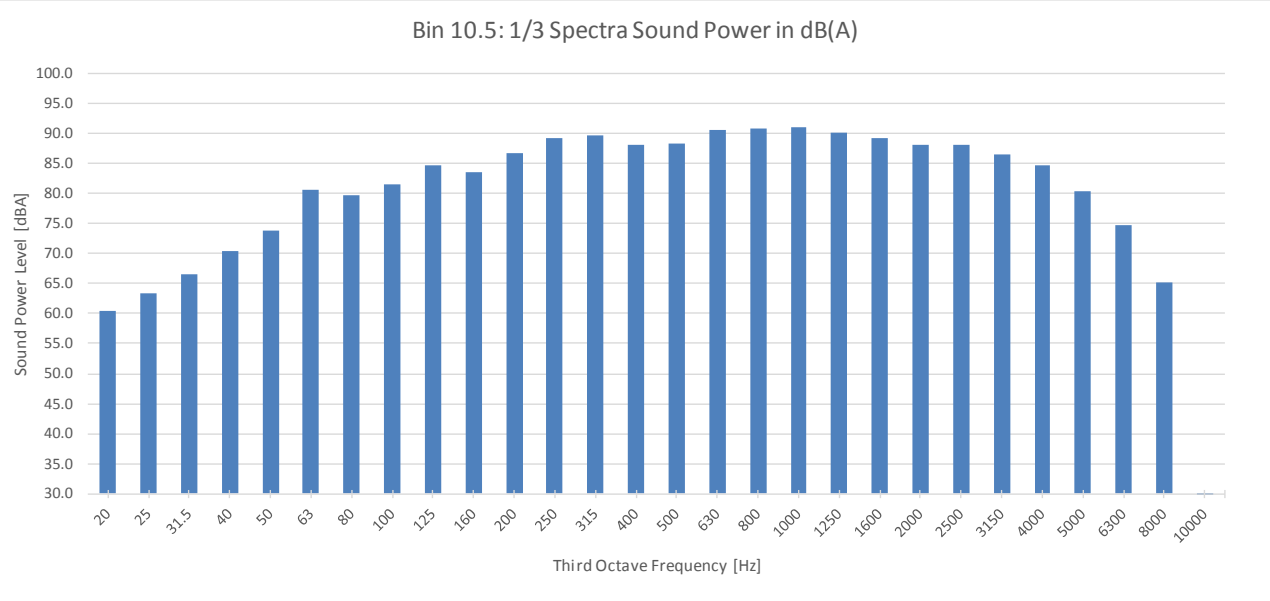
Bin 9.5: 1/3 Spectra Sound Power in dB(A)														
Frequency[Hz]	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400
Laeq	60.8	63.8	67.3	71.0	74.3	79.7	79.9	82.3	85.1	84.5	87.7	90.1	90.1	88.5
U_c	0.9	0.9	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Frequency[Hz]	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
Laeq	88.7	90.6	90.4	90.5	89.7	89.1	88.1	88.2	86.6	84.7	80.3	74.5	65.1	[56.8]
U_c	0.8	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.1	1.6	1.7

[ ] Total Noise less than 3 dB greater than background (3 dB correction applied).



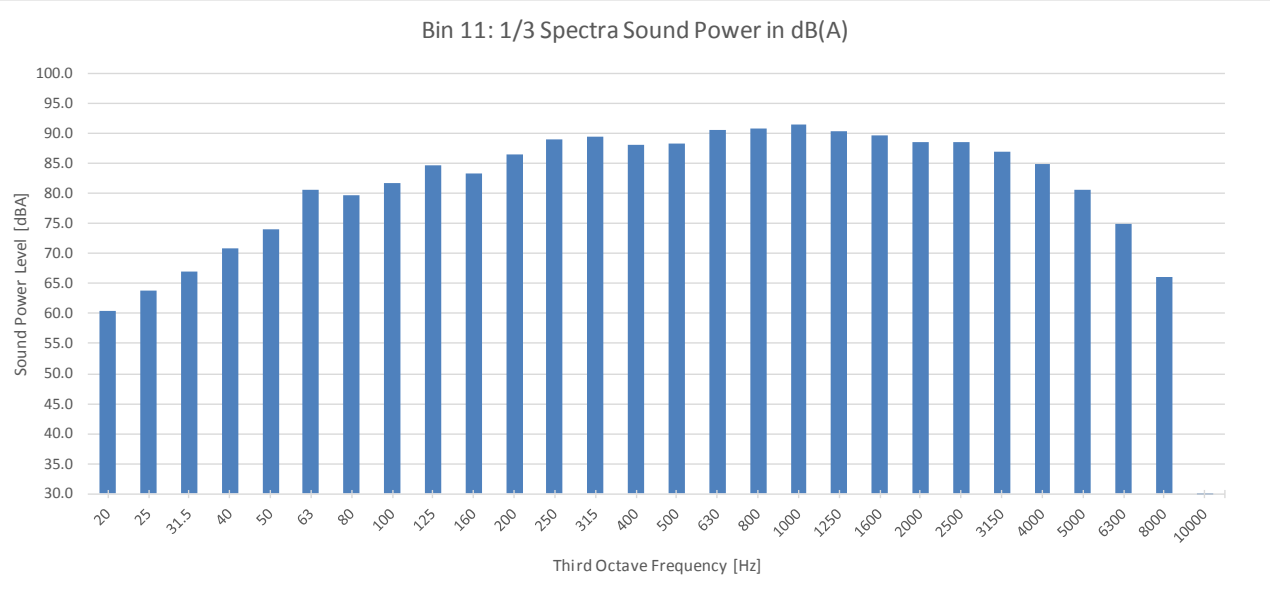
Bin 10: 1/3 Spectra Sound Power in dB(A)														
Frequency[Hz]	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400
Laeq	61.0	63.6	67.3	71.1	74.4	80.3	80.1	82.2	85.1	84.1	87.2	89.4	89.5	88.0
U_c	0.9	0.9	1.0	1.0	0.9	0.9	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Frequency[Hz]	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
Laeq	88.3	90.5	90.5	90.8	89.8	89.2	88.1	88.1	86.6	84.7	80.3	74.5	65.6	[57.5]
U_c	0.8	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.1	1.5	1.8

[ ] Total Noise less than 3 dB greater than background (3 dB correction applied).



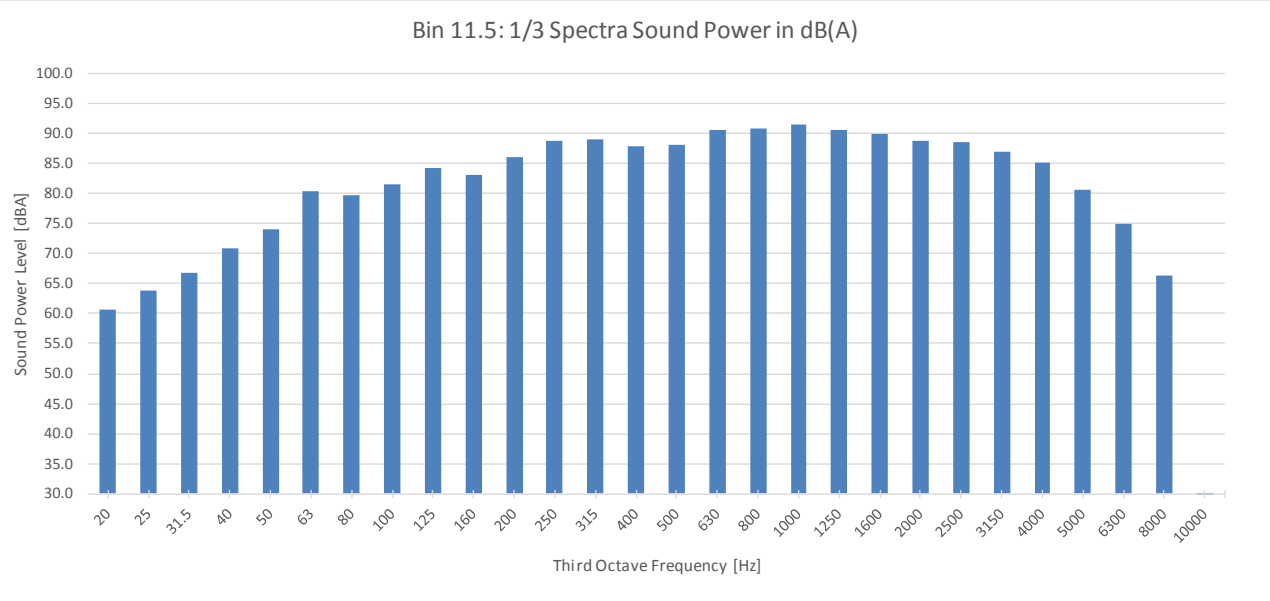
Bin 10.5: 1/3 Spectra Sound Power in dB(A)														
Frequency[Hz]	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400
Laeq	60.4	63.3	66.5	70.4	73.8	80.6	79.6	81.5	84.6	83.5	86.7	89.2	89.6	88.1
U_c	0.9	1.0	1.0	1.0	1.0	0.9	0.9	0.7	0.7	0.7	0.8	0.7	0.7	0.7
Frequency[Hz]	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
Laeq	88.4	90.6	90.8	91.1	90.1	89.3	88.2	88.0	86.5	84.6	80.4	74.7	65.3	[57.5]
U_c	0.8	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.9	1.1	1.2	1.8	1.8

[ ] Total Noise less than 3 dB greater than background (3 dB correction applied).



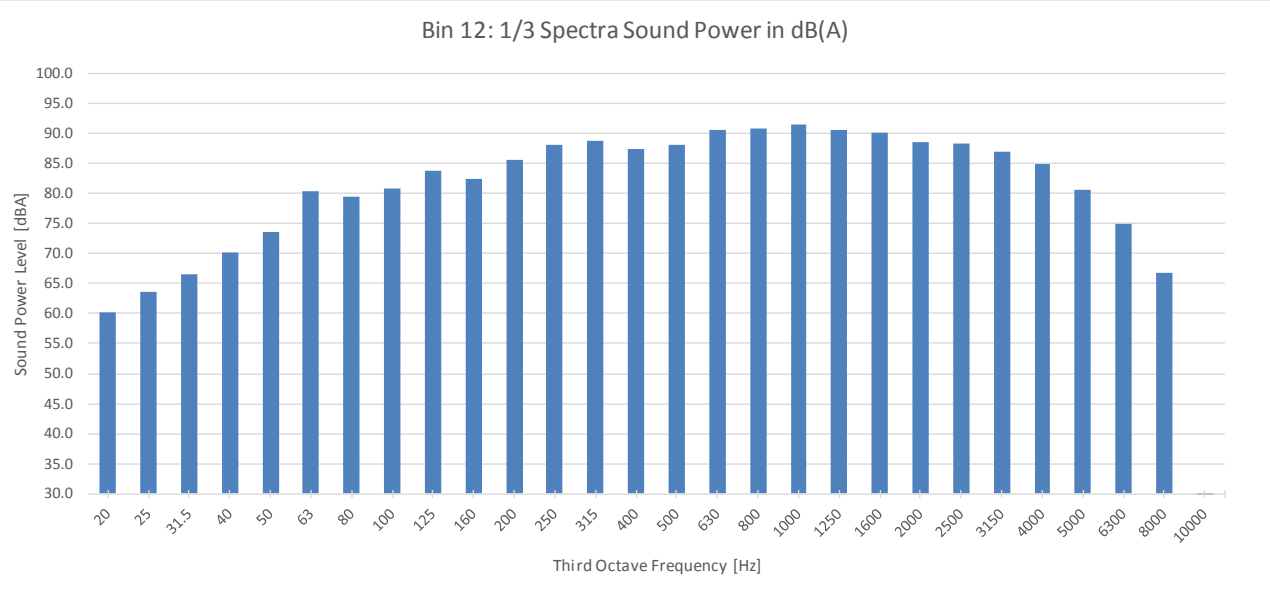
Bin 11: 1/3 Spectra Sound Power in dB(A)														
Frequency[Hz]	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400
Laeq	60.5	63.8	67.1	70.9	74.1	80.6	79.8	81.7	84.6	83.4	86.6	88.9	89.4	88.0
U_c	0.9	0.9	1.0	0.9	0.9	0.9	0.9	0.7	0.7	0.7	0.8	0.7	0.7	0.7
Frequency[Hz]	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
Laeq	88.4	90.6	90.8	91.4	90.3	89.7	88.5	88.5	86.9	85.0	80.6	74.9	66.2	[58.1]
U_c	0.8	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.9	1.1	1.1	1.5	1.8

[ ] Total Noise less than 3 dB greater than background (3 dB correction applied).



Bin 11.5: 1/3 Spectra Sound Power in dB(A)														
Frequency[Hz]	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400
Laeq	60.6	63.9	66.9	70.9	74.1	80.5	79.7	81.5	84.2	83.0	86.1	88.7	89.1	87.9
U_c	0.9	0.9	1.0	1.0	0.9	0.9	0.9	0.7	0.7	0.7	0.8	0.7	0.8	0.7
Frequency[Hz]	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
Laeq	88.2	90.6	90.9	91.5	90.5	90.0	88.7	88.6	87.0	85.1	80.7	75.0	66.3	[58.3]
U_c	0.8	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.9	1.1	1.1	1.5	1.8

[ ] Total Noise less than 3 dB greater than background (3 dB correction applied).



Bin 12: 1/3 Spectra Sound Power in dB(A)														
Frequency[Hz]	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400
Laeq	60.2	63.7	66.5	70.2	73.6	80.3	79.4	80.8	83.8	82.5	85.6	88.2	88.8	87.5
U_c	0.9	1.0	1.0	1.0	1.0	0.9	0.9	0.8	0.7	0.7	0.8	0.7	0.8	0.7
Frequency[Hz]	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
Laeq	88.0	90.5	90.8	91.6	90.7	90.1	88.6	88.4	86.9	84.9	80.6	74.9	66.7	[58.4]
U_c	0.8	0.8	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.9	1.1	1.1	1.4	1.8

[ ] Total Noise less than 3 dB greater than background (3 dB correction applied).

APPENDIX C:

TONALITY ASSESSMENT

BIN 7.5: Detected tones
No relevant tones.

BIN 8: Detected tones
No relevant tones.

BIN 8.5: Detected tones
No relevant tones.

BIN 9: Detected tones
No relevant tones.

BIN 9.5: Detected tones
No relevant tones.

BIN 10: Detected tones
No relevant tones.

BIN 10.5: Detected tones
No relevant tones.

BIN 11: Detected tones
No relevant tones.

BIN 11.5: Detected tones
No relevant tones.

BIN 12: Detected tones
No relevant tones.

END OF DOCUMENT