

July 14, 2016

Jeremy Goertz

Saturn Power GP Ltd. as general partner for Gesner Wind Farm LP

100 Mill Street, Unit F

New Hamburg, Ontario

N3A 2K6

**Re: Acoustic Audit of the Gesner Wind Farm Transformer Station
Renewable Energy Approval 3069-8NQQC7**

Dear Mr.Goertz,

As requested, HGC Engineering visited the Gesner Wind Farm and the surrounding area on July 6, 2016 to perform acoustical audit measurements of the transformer station associated with the Gesner Wind Farm. The audit is required as condition J39 of Renewable Energy Approval (“REA”), number 3069-8NQQC7, granted to the facility by the Ontario Ministry of the Environment and Climate Change (“MOECC”) dated June 20, 2016. An updated Acoustic Assessment Report (“AAR”), which introduced the transformer substation as a noise source, was prepared by Stantec in June 2013 to support the application for the REA.

DESCRIPTION OF FACILITY AND SURROUNDING AREA

The components of the substation include a step-down transformer, manufactured by Virginia Transformer Corp., and a grounding transformer, manufactured by Northern Transformer. The station is situated east of the town of Muirkirk, Ontario, and is within 2 km of the project turbines. The step-down transformer is nominally rated at 10 MVA, and the associated grounding transformer is rated at 2.4 MVA. An acoustic barrier has been installed on the west, north and east sides of the step-down transformer with an approximate overall length of 15 meters and a height of 5.5 meters. Both units utilize natural cooling, and thus do not have cooling fans. The equipment operates 24 hours per day, 7 days per week.

The nearest and most potentially impacted noise sensitive points of reception are three non-participating residential dwellings (NP_POR004, NP_POR028 and NP_POR29), all greater than 450 metres to the northeast of the station, as depicted in Figure 1.

The area is best characterized as a Class 3 acoustic environment under MOECC guideline NPC-300.

MEASUREMENT METHOD

The audit measurements were conducted at location M1, as marked in Figure 1, near the points of reception described above on July 6, 2016. During the audit measurements, two quantities of note were recorded: the L_{EQ} and the L_{90} sound levels. The L_{EQ} sound level is the *energy-equivalent sound*



ACOUSTICS



NOISE



VIBRATION

level, and represents the integrated sound exposure level of both steady and time-varying sounds over the duration of the measurement. The L_{90} represents the sound level which is exceeded 90 percent of the time over the duration of the measurement, and is therefore useful in identifying the contribution of steady sources such as sound emissions from the subject facility to the overall sound level.

The sound level measurements were conducted during afternoon hours with low to moderate ground-level winds. Hub height winds for the project turbines were sufficient for them to be generating power (on the order of 4 to 6 m/s). The energy-equivalent sound levels (L_{EQ}) were dominated by the surrounding turbines and bird calls. Since the emissions of the Gesner Wind Farm transformer are steady, the L_{90} evaluation parameter represents a better estimate of the sound levels produced by the transformer than does the L_{EQ} .

The sound level measurements were conducted during daytime hours with moderate ground level winds, using a Norsonic N-140 Precision Sound Analyser (SN 1403176). The measurements were conducted in accordance with the methods in MOECC procedural guideline NPC-103. All instrumentation was within its annual laboratory calibration period and correct calibration was field-verified using a Rion acoustic calibrator type NC-74. The calibration certificates are attached.

SOUND LEVEL CRITERIA

The MOECC noise assessment guidelines draw a distinction between sound produced by traffic sources and that produced by industrial or commercial activities, which are classified as *stationary sources of sound*. In essence, the sound from the stationary sources is evaluated against (i.e. compared to) the typical background sound at any potentially impacted, noise-sensitive points of reception (e.g., residences). Background sound is considered to include road traffic sound and other typical sounds, but excludes the sound of the facility under assessment.

The area surrounding the site is a Class 3 acoustic environment under MOECC publication NPC-300 “Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning” is the relevant guideline to determine the applicable limits.

NPC-300 states that the sound level limit for a stationary source that operates during daytime and nighttime hours in a Class 3 (Rural) environment is the lower of the minimum one-hour L_{EQ} ambient (background) sound level or the minimum one-hour ninetieth percentile L_{90} sound level plus 10 dB (i.e. $L_{90} + 10$ dB) at any potentially impacted residential point of reception. In addition, NPC-300 states exclusionary minimum limits of 45 dBA during daytime hours (07:00 – 19:00) and 40 dBA during nighttime hours (19:00 – 07:00).

Based on observations and sound level measurements in the area, background sound levels may fall below the exclusionary minimum limits stipulated in NPC-300 for Class 3 Areas, during the quietest hours of the day and night. Therefore, consistent with the updated AAR, the exclusionary minima of 45/40 dBA (day/night) were assumed to be the applicable sound level limits at all points of reception for the transformer station.



MEASUREMENT RESULTS & DISCUSSIONS

Table 1 below, lists the measured sound levels, as well as the estimated sound levels of the facility at the nearest points of reception. The estimated sound level was based on a free field sound attenuation over the distance from the measurement location to the off-site residential receptors. The estimate procedure is conservative, as it does not include the effect of other typical attenuating factors such as ground and air absorption, foliage etc.

Table 1: Summary of Audit Measurements

Location	Measurement Point		Receptor Location		Assessment Criteria (D/N) [dBA]
	Dist ^A [m]	L ₉₀ ^B [dBA]	Dist ^A [m]	L ₉₀ ^C [dBA]	
NP_POR004/M1	375	35	450	34	45 / 40
NP_POR028/M1			490	33	45 / 40
NP_POR029/M1			495	33	45 / 40

A – Distances are relative to the dominant facility noise source closest to the point of reception
 B – As measured sound level
 C – Distance adjusted sound level

A tonality penalty under MOECC guideline NPC-104 applies for sound sources which are tonal in nature. Observations and measurements at the receptors indicate the transformer station was not audible over the surrounding background sound and therefore a tonal penalty has not been applied to the measurements above. Because the transformer was not audible near the surrounding receptors, the measured sound levels represent an upper bounding estimate of the sound level of the transformer station.

The sound levels of the transformer station at the closest non-participating receptors were measured to be less than 35 dBA, which is within the most stringent sound level criteria of NPC-300.

The noise control measures described in Schedule C of the approval have been implemented.

CONCLUSIONS

The results of the Acoustic Audit measurements demonstrate that the sound emissions of the Gesner Wind Farm Transformer Station comply with the applicable sound level limits established in accordance with guideline NPC-300 during all hours of the day and night at all noise-sensitive points of reception.

Trusting this information is satisfactory, if you have any questions, please do not hesitate to call.

Yours truly,

Howe Gastmeier Chapnik Limited


Iouri Basmanov, BAsC

Reviewed by


Ian Bonsma, P.Eng.





Figure 1: Sound Level Measurement Locations
Gesner Wind Farm Transformer Station



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APPENDIX A

Instrument Calibration Certificates



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VIBRATION

www.hgcengineering.com

CERTIFICATE of CALIBRATION

Make : Norsonic Reference # : 142235
Model : NOR140 Customer : HGC Engineering
Mississauga, ON
Descr. : Sound Level Meter Type 1
Serial # : 1403176 P. Order : Sean Richarson
Asset # : N-140-1
Cal. status : Received in spec's, no adjustment made.

M
4 Jul 2016

Navair Technologies certifies that the above listed instrument was calibrated on date noted and was released from this laboratory performing in accordance with the specifications set forth by the manufacturer.

Unless otherwise noted in the calibration report a 4:1 accuracy ratio was maintained for this calibration.

Our calibration system complies with the requirements of ISO-17025 standard, working standards used for calibration are certified by or traceable to the National Research Council of Canada or the National Institute of Standards and Technology.

Calibrated : Dec 24, 2015

By : *as per Godewar*
T. Beilin

Cal. Due : Dec 24, 2016

Temperature : 23 °C ± 2 °C Relative Humidity : 30% to 70%

Standards used : J-216 J-303 J-512

Navair Technologies

REPAIR AND CALIBRATION TRACEABLE TO NRC AND NIST

6375 Dixie Rd. Mississauga, ON, L5T 2E7
Phone : 905 565 1584

Fax: 905 565 8325

<http://www.navair.com>
e-Mail: navair@navair.com

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CERTIFICATE of CALIBRATION

Make : RION Co. Ltd

Reference # : 142252

Model : NC-74

Customer : HGC Engineering
Mississauga, ON

Descr. : Sound cal 94dB 1KHz

Serial # : 00430644

P. Order : Sean Richarson

Asset # : RION#4

Cal. status : Received in spec's, no adjustment made.

AR
4 JAN 2016

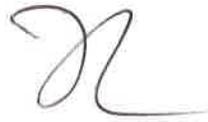
Navair Technologies certifies that the above listed instrument was calibrated on date noted and was released from this laboratory performing in accordance with the specifications set forth by the manufacturer.

Unless otherwise noted in the calibration report a 4:1 accuracy ratio was maintained for this calibration.

Our calibration system complies with the requirements of ISO-17025 standard, working standards used for calibration are certified by or traceable to the National Research Council of Canada or the National Institute of Standards and Technology.

Calibrated : Dec 28, 2015

By :



Cal. Due : Dec 28, 2016

J. Raposo

Temperature : 23 °C ± 2 °C Relative Humidity : 30% to 70%

Standards used : J-163 J-261 J-282 J-508

Navair Technologies

REPAIR AND CALIBRATION TRACEABLE TO NRC AND NIST

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