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ADDENDUM
TO
REPORT NO. 1755-010606-D

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UPDATED NOISE MODELING RESULTS BASED ON NEW DATA FROM CLIPPER WINDPOWER

COHOCTON WIND FARM PROJECT

COHOCTON, NY

PREPARED FOR:

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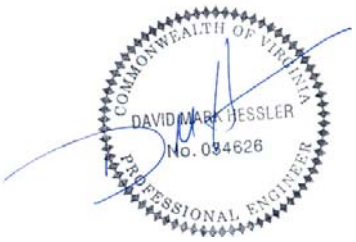

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1.0 INTRODUCTION

A noise impact assessment for the Cohocton Wind Farm project was prepared by Hessler Associates, Inc. for UPC Wind Management and submitted on November 15, 2006 (Report 1755-010606-D). At that time the only noise emissions information available for the Clipper C96 wind turbine planned for the project was preliminary in nature and was developed from measurements of a prototype that did not have certain noise abatement features that will be present on the production model. This preliminary, unmitigated sound spectrum was used to carry out the predictive noise modeling for the project described in the November report since it was the only available information.

Since the original report was submitted Clipper Windpower has installed noise mitigation on the prototype and has carried out further noise emissions tests. The new sound power level information, received in preliminary from Clipper in early December and in final form in a report dated March 1, 2007, indicates that the noise emissions of the units that will actually be installed at the Cohocton site will be significantly quieter than previously expected based on the measurements of the unmitigated prototype.

This Addendum to Report 1755-010606-D replots the project sound level contours based on the new sound power level spectrum provided by Clipper and the latest site layout (as of 2/27/07) and briefly describes the resulting change in the project's expected noise impact on the community.

2.0 REVISED PROJECT NOISE MODELING AND IMPACT ASSESSMENT

2.1 ASSESSMENT CRITERIA

There are two metrics against which to compare the predicted noise from the project and thereby determine if any adverse environmental impacts might result from it. The first of these measures is a local regulatory noise limit and the second is a set of noise assessment guidelines published by the New York State Department of Environmental Conservation (NYSDEC).

2.1.1 REGULATORY NOISE LIMITS

A local (Town of Cohocton) noise ordinance has been established that limits noise from any wind energy conversion facility to a maximum of 50 dBA "at the boundaries of all abutting parcels that are owned by persons other than the owner of the parcel on which each turbine is located". Other restrictions include a maximum allowable project sound level of 45 dBA outside any non-participating residence and a numerical limit on tonal noise. Unacceptable pure tones are "defined to exist when a one-third (1/3) octave band noise level exceeds the arithmetic average of the two adjacent one-third (1/3) octave band levels by the following:

Band Range	Exceedance
31.5 – 125 Hz	15 dB
160 – 400 Hz	8 dB
500 – 8000 Hz	5 dB"

There are no other overarching state or federal noise regulations that would apply to the project.

3.1.2 NYSDEC GUIDELINES

In the Program Policy *Assessing and Mitigating Noise Impacts* published by the New York State Department of Environmental Conservation (2001) a methodology is described for evaluating

potential community impacts from any new noise source. As opposed to an absolute noise limit at property lines, the NYSDEC method is fundamentally based on the perceptibility of the new source above the existing background sound level at the nearest houses where people actually reside. The likelihood of someone being regularly present at the extreme edge of their property seems much lower than their being in or near the residence. Consequently, the dwelling itself is considered the more relevant location to examine the potential for disturbance from project noise.

It is a well established fact for a new broadband, atonal noise source, such as a wind turbine, that a cumulative increase in the total sound level of about 5 or 6 dBA at a given point of interest is required before the new sound begins to be clearly perceptible or noticeable to most people. Cumulative increases of between 3 and 5 dBA are generally regarded as negligible or hardly audible. Lower sound levels from the new source are completely "buried" in the existing background sound level and are totally inaudible. The specific language relating to these perceptibility thresholds in the NYSDEC program policy (Section V B(7)c) is a follows:

> Increases ranging from 0-3 dB should have no appreciable effect on receptors. Increases from 3-6 dB may have potential for adverse noise impact only in cases where the most sensitive receptors are present. Sound pressure increases of more than 6 dB may require closer analysis of impact potential depending on existing SPL's [sound pressure levels] and the character of surrounding land use and receptors.

What this essentially says is that a cumulative increase in the total ambient sound level of 6 dBA or less is unlikely to constitute an adverse community impact. From a practical standpoint, because decibels add logarithmically, this threshold means that noise from the project could exceed the existing background level by up to 5 dBA. For this project, the measured background level of **37 dBA** (during an 8 m/s wind) plus a project-only noise level of **42 dBA** would equal a total cumulative level of 43 dBA – or 6 dBA above the original level.

The program policy outlines an incremental approach towards evaluating cumulative increases and potential impacts. Once the background sound level is established by means of a field survey a **First Level Noise Impact Evaluation** is carried out where noise from the future project is modeled in an extremely simple and conservative manner considering only the reduction in sound level with distance in accordance with the inverse square law. All other natural forms of sound propagation loss, such as from intervening terrain, vegetation, etc., are ignored and the ground surface is assumed to be completely reflective as though it were the surface of a large placid lake. The purpose of this analysis is to simply identify the area, defined by the 6 dBA cumulative increase contour line (42 dBA in this instance), that needs to be looked at in greater detail to see if any sensitive receptors are present.

If any residences or other potentially sensitive receptors are identified as being within the area of potential concern a **Second Level Noise Impact Evaluation** noise modeling study is carried out realistically considering all normal sound propagation loss mechanisms (in addition to pure distance losses). In this case, any receptors outside the 6 dBA cumulative increase contour are considered to have a low probability of disturbance while any receptors inside the contour might be adversely impacted and some form of mitigation should be investigated.

Preliminary noise modeling carried out in the earlier design phase of the project to help optimize the turbine layout with respect to potential community noise impacts indicated that, irrespective of subsequent minor changes to the site plan, there would be homes present within First Level Impact area. Consequently, the modeling discussed below begins with a Second Level Impact analysis.

2.2 TURBINE NOISE LEVELS

A prototype of the Clipper C96 wind turbine, with a slightly smaller rotor diameter of 93 m (as opposed to 96 m), has been built for testing and design refinement purposes and recent sound level measurements of this unit have been made after the installation of some noise mitigation measures. Similar, if not identical, noise abatement will be installed in the C96 production model – the turbine that will actually be used for the Cohocton project.

The measured sound level of the prototype prior to the retrofits was used in the original modeling study since that was only information available at the time. The new octave band sound power level is tabulated below along with the preliminary spectrum. This new noise information is taken directly from the field test results obtained by Channel Island Acoustics on behalf of Clipper Windpower. As summarized in Report TOT0606-06 IM[1] the testing was carried out in accordance with IEC 61400-11:2002 *Wind turbine generator systems – Acoustics measurement techniques*.

Table 2.2.1 *Clipper C96 Prototype Sound Power Level Spectrum (in an 8 m/s wind at 10 m agl) Before and After the Installation of Noise Mitigation Features*

Octave Band Center Frequency, Hz	31.5	63	125	250	500	1k	2k	4k	8k	dBA
Preliminary Sound Power Level 9/15/06, dB re 1 pW	**114.5**	**110.2**	**108.8**	**105.8**	**105.0**	**99.3**	**90.7**	**85.1**	**68.3**	**104.7**
New Sound Power Level as of 12/4/06, dB re 1 pW	**120.9**	**114.1**	**108.7**	**104.2**	**101.9**	**96.9**	**91.8**	**84.7**	**75.9**	**103.0**

The more detailed 1/3 octave band sound power level spectrum of the prototype before and after modifications is shown below. The principal goal of the mitigation was to minimize the slight prominences at 160, 400 and 1000 Hz and smooth out the spectrum.

[1] Walker, B. (Channel Island Acoustics), Report TOT0606-06 IM *Acoustic Measurement and Assessment Report for Clipper 2.5 MW Wind Turbine Noise Emissions*, Prepared for Clipper Windpower, Inc., Carpenteria, CA, March 1, 2007.

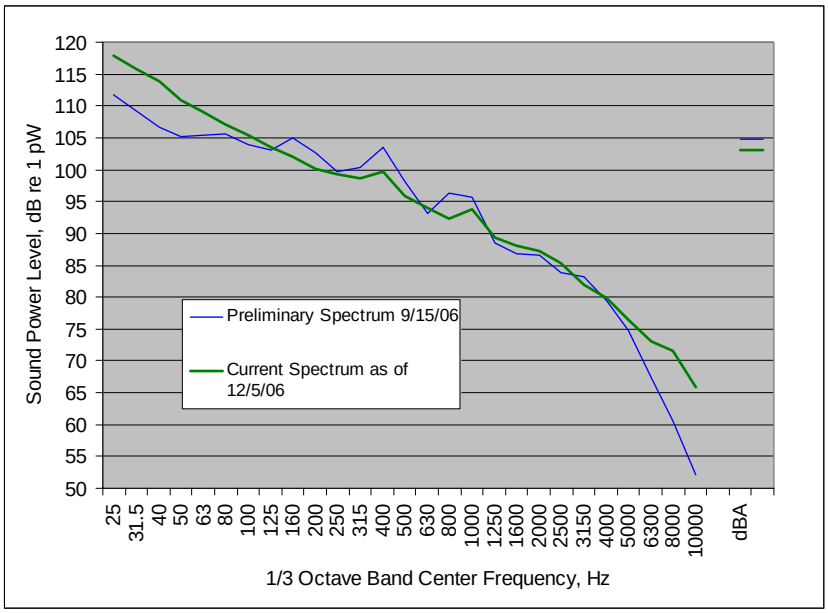


Figure 2.2.1 *Preliminary and Current 1/3 Octave Band Sound Power Level Spectrum for the Clipper C96 Wind Turbine (from Prototype Field Measurements)*

2.3 NOISE MODELING METHODOLOGY

Using the latest (12/5/06) sound power level spectrum in Table 2.2.1 above, a worst-case, maximum noise level contour plot for the site was calculated using the "Cadna/A", ver. 3.5 noise modeling program developed by DataKustik, GmbH (Munich). This software enables the project and its surroundings, including terrain features, to be realistically modeled in three-dimensions. The somewhat complex hill and valley topography of this site was digitized into the noise model from USGS maps. Each turbine is represented as a point noise source at a height of 80 m above the local ground surface (design hub height).

A somewhat conservative ground absorption coefficient of 0.5 has been assumed in the model since all of the intervening ground between the turbines and potentially sensitive receptors essentially consists of open farm fields or pasture land with a few wooded areas. Ground absorption ranges from 0 for water or hard concrete surfaces to 1 for absorptive surfaces such as farm fields, dirt or sand. Consequently, a higher ground absorption coefficient on the order of 0.7 to 0.9 would be fully justified here; however, for conservatism the value of 0.5 has been used. In addition, any additional attenuation that might result from wooded areas has been completely neglected in all calculations.

Although wind direction effects can be modeled with this software, to be conservative the noise level from each turbine is assumed to be the downwind sound level in *all directions simultaneously*. In other words, although physically impossible, an omnidirectional 8 m/s wind is assumed. This approach yields a contour plot that essentially shows the maximum possible sound level at any given point and sometimes also shows levels that cannot possibly occur – such as between two or more adjacent turbines, since the wind would have to be blowing in two opposing directions at the same time. In a more realistic scenario with, for example, a wind out of the west the contour lines would occur closer to the turbines on the west side and would remain as shown on the east.

At the risk of significantly overestimating potential project sound levels, the various conservative assumptions in the Second Level modeling analysis have been applied to ensure that the impact of

project noise on the community does not exceed predicted levels. Sound levels that are substantially lower than those predicted in the modeling plots are actually expected to occur. The model represents a theoretical worst-case condition that would require a practically impossible convergence of wind direction, wind speed, low ground porosity and favorable atmospheric sound propagation conditions to occur.

2.4 MODEL RESULTS

The overall results of the Second Level model with the new turbine sound power level are shown in **Graphic B**. This plot represents a conservative view of what can be expected with all turbines operating at their maximum noise point assuming an omni-directional 8 m/s wind. Non-participating residences are represented by yellow triangles and blue boxes indicate the homes of project participants.

The area inside of the 42 dBA sound contour (shown in green) represents the region where noise from the project may be audible above the residual (L90) background level; i.e. where the cumulative sound level is expected to be 6 dBA or more above the pre-existing level.

Relative to the plots in the original assessment report based on preliminary measurements of the unmitigated prototype, this plot is noteable in that far fewer residences lie on or inside the region bounded by the 42 dBA contour. This means that the vast majority of residents in the project area, where sound levels are predicted to be less than 42 dBA, will be largely or completely unaffected by project noise. Only three non-participating residences may potentially experience sound levels in the 42 to 43 dBA range under worst-case circumstances. The remaining 7 homes on or inside the 42 contour belong to project participants where an adverse reaction to project is unlikely. The predicted sound level at most of these participating homes is also in the vicinity of 42 to 43 dBA with one, in the Brown Hill section, at 44 dBA.

In general, small changes of 1 to 3 dBA in sound level are very hard to subjectively perceive so it is not a foregone conclusion that someone experiencing a project-only sound level of 43 dBA, for example, would react any differently to sounds from the turbines than someone projected to see a level of 42 dBA. The dividing line between an acceptable and adverse impact from wind turbine noise in particular is more indistinct than it is with other types of noise sources, such as a conventional power station, and much of it has to do with an individual's general attitude towards the project and aspects of it that have nothing to do with noise. As a result, it would be incorrect to assume that everyone within the 42 dBA sound contours will find project noise objectionable. Instead, it might be more accurate to say that mild annoyance may be felt in one or two instances but strongly adverse reactions are considered improbable since the maximum sound level at any non-participating receptor is not expected to exceed 43 dBA. In absolute terms, a sound level of 45 dBA is normally considered "quiet" and is a value that commonly appears in regulatory standards and guidelines worldwide (U.S. EPA, HUD, World Bank, World Health Organization, etc.) as an acceptable nighttime noise level.

In general, the perceptibility of project noise in the vicinity of the 42 dBA contour is likely to be intermittent in nature. For the predicted sound levels in the contour plots to have any chance of actually occurring at residences with predicted levels of 42 dBA or more the following conditions would be necessary:

- The wind would need to be blowing from the nearest turbines towards the house
- The wind would need to be blowing a speed of 8 m/s or greater at 10 m above ground level (lower wind speeds would be associated with lower project sound levels)
- The ground surface would need to be semi-reflective (as might happen when it is frozen or partially covered with ice or glazed snow)

The perceptibility of turbine noise under these conditions would also require that a background sound level of 37 dBA or less is occurring at the point of observation and that the observer is standing outside. Higher background levels would obscure project noise and the 15 to 20 dB attenuation afforded by any house would make a project sound level of 42 dBA outside completely inaudible inside.

In summary, the new model predictions ostensibly indicate that project noise might be audible at a few houses but the circumstances required for this to occur would happen only rarely at best. Consequently, no significant or sustained adverse impact is expected at any home in the project vicinity due to project noise.

2.5 COMPLIANCE WITH TOWN OF COHOCTON NOISE ORDINANCE

The Town of Cohocton Noise Ordinance limits noise exclusively from the project to 50 dBA at the property line of any parcels of land belonging to non-participants in the project. **Graphic C** shows the 50 dBA sound level contour using the new turbine sound power level, calculated under the conservative conditions described above, relative to the land parcels owned by project participants (shaded yellow).

This graphic illustrates that project sound levels of 50 dBA or more will be confined to participating properties. It is also important to note that these sound levels would only occur intermittently during windy conditions and there would be no noise whatsoever from the project at these property boundaries during calm or low wind conditions.

The second condition of the Ordinance limits project noise to 45 dBA outside any non-participating residences. As illustrated in Graphic B, the maximum predicted sound level at any non-participating residence is just under 43 dBA so compliance is anticipated at all residences under all wind conditions.

Finally, the Ordinance limits tonal noise to a set of specific 1/3 octave band exceedances applicable in different regions of the frequency spectrum (see Section 2.1.1). As illustrated in Figure 2.2.1, the acoustical modifications to the prototype turbine have significantly reduced the minor prominences that had previously existed in the sound power level spectrum. There is no longer any prominence at 160 Hz and the 400 and 1000 Hz “tones” have been substantially suppressed.

The table below lists the values of the current prominent frequency bands in the power level spectrum and compares them to the Ordinance limits. It should be noted that the sound power level spectrum represents the frequency spectrum that occurs fairly close to the turbine. Beyond the minimum setback distance of 1500 feet these tones are likely to become substantially less prominent.

Table 2.5.1 *Prominent Bands in the Clipper C96 Sound Power Level Spectrum (After Installation of Noise Abatement Measures) Relative to Ordinance Tonal Limitations*

Nominal Tone Frequency, Hz	1/3 Octave Band Sound Power Level of "Tone" and Two Adjacent Bands, dB re 1 pW	Exceedance above Average of Adjacent Bands, dB	Applicable Cohocton Ordinance Limit, dB (as Observed at a Prop. Line or Residence)
400	98.6 **99.6** 95.6	2.5	8
1000	92.2 **93.7** 89.4	2.9	5

As can be seen from this table, the slightly prominent bands in the power level spectrum are well within the permissible limits. Consequently, it is anticipated that the project will comply with the tonal restrictions contained in the Cohocton Noise Ordinance.

3.0 CONCLUSIONS

Updated predictions of the sound levels likely to result from the Cohocton Wind Farm Project, using the latest noise emissions data for the C96 wind turbine and latest site plan, indicate that far fewer residences are likely to be potentially impacted by project noise than previously hypothesized in the original assessment (Report 1755-010606-D, 11/15/06).

The overall sound level of the C96 turbine is now expected to be roughly 2 dBA quieter than before based on new field measurements of the prototype turbine made after the installation of several noise abatement features – features that will be incorporated into the production model used in the project.

This reduction in fundamental sound power translates into a significant contraction of the 42 dBA sound level contour, which largely defines the area of potentially adverse impact per the NYSDEC assessment guidelines. The overwhelming majority of residences in the project area are now beyond the 42 dBA threshold. The new contour plot calculations show that only four non-participating residences may be affected by project noise under rare, worst-case wind and atmospheric conditions.

As previously concluded, the project is expected to fully comply with the Town of Cohocton ordinance limits related to wind energy conversion projects.

- No non-participating residence is expected to experience a sound level of 45 dBA or more due to project noise under any circumstances.
- The limit of 50 dBA at all non-participating property lines is expected to be met at all locations.
- The latest sound power level spectrum for the C96 turbine shows that it contains no significant tones and will not exceed the frequency dependent tonal noise restriction contained in the ordinance.

Description:

Graphic B

Predicted Sound Contours (dBA)
of Wind Turbines with
Omnidirectional 8m/s Wind
NYSDEC Second Level Evaluation

Project:

Cohocton Wind Farm
Main & Brown Hill Sections

Drawing Number:

CW-Rev-H-2-1-1

Date:

May 31, 2007

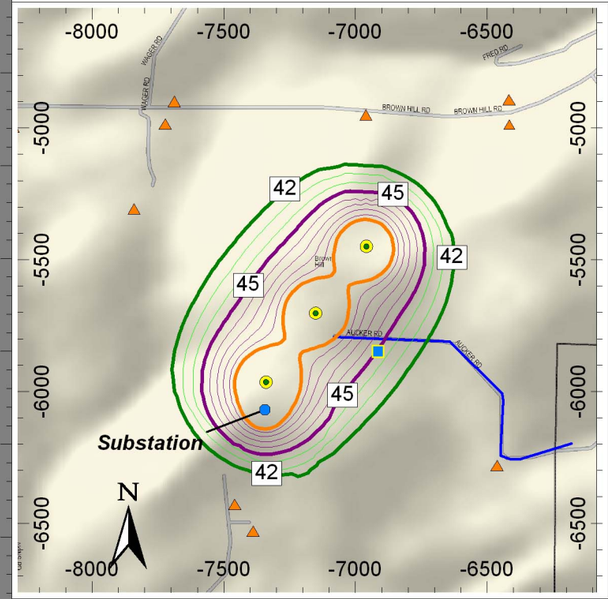
Prepared for:

UPC Wind Management, LLC

Legend:

- Turbine Location
- Participating Residence
- Nearby Non-Participating Residences

Note: Scales are in meters



Brown Hill Section

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Description:

Graphic C

Predicted Sound Contours (dBA)
of Wind Turbines with
Omnidirectional 8 m/s Wind
NYSDEC Second Level
Evaluation Calculation Criteria

Property Line Ordinance
Compliance Evaluation

Project:
Cohocton Wind Farm

Drawing Number:
CW-Rev-H-2-1

Date:
May 31, 2007

Prepared for:
UPC Wind Management, LLC

Legend:

- Participating Property
- Turbine Location

Scales in meters

Hessler Associates, Inc.

Consultants in Engineering
Acoustics Since 1976

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Main Site

Brown Hill Area