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**STATE OF MINNESOTA
OFFICE OF ADMINISTRATIVE HEARINGS
FOR THE MINNESOTA PUBLIC UTILITIES COMMISSION**

**IN THE MATTER OF THE APPLICATION BY AWA GOODHUE WIND, LLC
FOR A SITE PERMIT FOR A LARGE WIND ENERGY CONVERSIONS SYSTEM FOR A 78 MW
WIND PROJECT IN GOODHUE COUNTY**

DIRECT TESTIMONY

OF

TIM CASEY

NATIONAL ENVIRONMENTAL ACOUSTICS PROGRAM MANAGER

HDR ENGINEERING, INC.

JANUARY 28, 2011

DIRECT TESTIMONY OF TIM CASEY

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1 **BEFORE THE MINNESOTA PUBLIC UTILITIES COMMISSION**

2 **DIRECT TESTIMONY OF TIM CASEY**

3 **I. INTRODUCTION AND QUALIFICATIONS**

4 **Q: Please state your name and business address.**

5 A: My name is Tim Casey. My business address is 701 Xenia Avenue South Suite 600,
6 Minneapolis, Minnesota 55416.

7 **Q: By whom are you employed and what is your position?**

8 A: I am employed by HDR Engineering, Inc. HDR is a consulting and engineering firm that
9 was founded almost 100 years ago, in 1917. The company has more than 7,800 professionals at
10 nearly 200 offices worldwide. My position at HDR is senior environmental scientist, and I am
11 also HDR's National Acoustics Program Manager.

12 **Q: Please describe your educational background.**

13 A: I received a Bachelor of Science degree in Biology from the Saint Xavier College in
14 Chicago in 1988. I completed graduate coursework in environmental engineering at Illinois
15 Institute of Technology and also in environmental health at the University of Minnesota.

16 **Q: Do you belong to any professional organizations?**

17 A: I am a full member of the Institute of Noise Control Engineering (INCE), and served as
18 vice-president and president of the local chapter of the Acoustical Society of America.

19 **Q: What has been your employment history?**

20 A: I have been employed by HDR since 1989. I have over 20 years of experience working
21 on issues related to noise and vibration from various type of projects located throughout the
22 United States, including combustion turbines, wind farms, construction projects, mineral

1 extraction, surface transportation systems, water delivery/distribution systems, wastewater
2 treatment facilities, and other architectural, industrial, and infrastructure noise sources.

3 **Q: For whom are you testifying?**

4 A: AWA Goodhue, LLC.

5 **Q: What is the purpose of your direct testimony?**

6 A: The purpose of my testimony is to explain the noise analysis HDR performed to
7 determine what sound levels might result from the wind turbines that are proposed to be installed
8 in Goodhue County as part of this project.

9 **Q: Please summarize your testimony.**

10 A: As part of the site permit for the project, HDR conducted a noise study that included
11 measuring existing noise levels and calculating potential wind turbine noise levels. HDR also
12 used a computer model called Cadna-A to perform an analysis of noise emissions from the
13 proposed wind turbines. HDR programmed the model in a manner that produces conservatively
14 high estimates of noise from the turbines. Analytical results indicate that turbine noise levels are
15 projected to be well under the daytime and nighttime noise limits set forth in the Minnesota
16 Pollution Control Agency noise standards.

17 **II. NOISE STUDY**

18 **Q: What are the Minnesota noise standards?**

19 A: The Minnesota Pollution Control Agency (MPCA) has promulgated standards for noise
20 in chapter 7030 of Minnesota Rules. The noise standards govern all outdoor noise on all types of
21 land uses, including industrial, commercial, and residential. The most stringent noise limit is
22 the nighttime limit of 50 dBA, expressed as an L₅₀. If a project can meet the most stringent noise
23 limit, it will also meet the other limits expressed in the MPCA noise standards.

1 **Q: What does 50 dBA mean?**

2 A: 50 dBA is a sound pressure level measured on the A-weighted decibel scale. The A-
3 weighted decibel scale (dBA) is used to reflect the selective sensitivity of human hearing. The
4 human range of hearing extends from approximately 3 dBA to around 140 dBA. For reference,
5 30 dBA corresponds to a quiet bedroom at night, 60 dBA corresponds to conversational speech,
6 90 dBA corresponds to a gas lawn mower at a distance of 3 feet, and 120 dBA corresponds to a
7 jet aircraft takeoff at a distance of 100 feet.¹ The 50 dBA level is representative of a large
8 business office, a dishwasher in an adjacent room, or quiet urban outdoor environment during the
9 daytime.

10 Using the decibel scale, sound levels from two or more noise sources cannot be
11 arithmetically added together to determine the overall sound level. Rather, the combination of
12 two sounds at the same level yields an increase of 3 dB. On average, a 3 dB change in the A-
13 weighted sound level is generally considered a noticeable change in loudness, whereas a 5 dB
14 increase is clearly noticeable. A 10 dB change is perceived by most people as a doubling or
15 halving of the perceived loudness.

16 **Q: What does L₅₀ mean?**

17 A: Noise levels are usually expressed with a component of time, to make the noise level
18 more meaningful in the context of human exposure to noise (noise vs. time). L₅₀ is the median or
19 average noise level exceeded 50% of the time in an hour. The nighttime L₅₀ noise limit of 50
20 dBA for residential receptors is the most stringent noise limit in the MPCA criteria; therefore it is
21 an appropriate standard for evaluating the acceptability of calculated wind turbine noise levels in
22 Minnesota.

¹ Environmental Impact Analysis Handbook, ed. by Rau and Wooten, 1980. See AWA Ex. 6-A, p. 2.

1 **Q: Are there any features or characteristics of the Project area that suggest a greater**
2 **sensitivity to sound level exposure in Goodhue County that would require a specialized**
3 **approach to the modeling?**

4 A: No, standard industry practices are appropriate for use on this project.

5 **Q: Please describe the noise study that HDR conducted.**

6 A: HDR performed 24-hour noise measurements at five locations in the project area to
7 determine what daytime and nighttime noise levels presently exist in those locations, before wind
8 turbines are even installed, and how the noise levels change from hour to hour. Typical existing
9 ambient noise levels in rural areas are dominated by agriculture-related activities, existing wind
10 conditions, local fauna, and proximity to other noise sources such as the noise from road
11 transportation sources or from stationary agricultural machinery. HDR selected locations to be
12 representative of the project area, and deployed noise monitoring systems to collect hourly noise
13 data over a 24-hour period. The noise analysis was conducted in accordance with the accepted
14 environmental noise assessment practices in the industry, and in accordance with methods used
15 on projects approved by the State of Minnesota.

16 **Q: Is this methodology a worst-case analysis?**

17 A: No, and it is not intended or required to be for compliance with the MPCA. In fact our
18 national environmental policy act removed requirements for worst case analyses when it was
19 amended in the 1980's. Therefore, the standard of analytical rigor in an environmental noise
20 assessment is not a worst case analysis.

21 **Q: What is the ambient noise environment in the Goodhue County area near the**
22 **project?**

1 A: The ambient acoustic environment in the Project area is dominated by noise from wind
2 and vehicular traffic, with additional contributions from agriculture-related activities. Daytime
3 background noise levels were dominated by vehicular traffic and natural sources. Nighttime
4 background noise levels were generally dominated by natural sources.

5 Existing L₅₀ hourly ambient noise levels ranged from 33 dBA to 52 dBA. HDR's monitoring
6 results show that existing noise levels in the project area exceeded the MPCA standards four
7 times within the 24-hour measurement period. These were all unattended measurements and
8 there is no way to confirm the source of the occurrences.

9 **Q: Please describe the modeling HDR conducted to predict sound levels from the**
10 **proposed Project.**

11 A: HDR used a computer model called Cadna-A. It is a well-accepted model in the industry
12 for estimating noise levels from outdoor noise sources. HDR programmed the Cadna-A model
13 in several ways to assume that maximum noise propagation conditions existed. First, we
14 assumed that wind would never impede sound pressure waves traveling from the turbines. This
15 is conservative, because the wind changes directions over time. HDR also programmed the
16 model to ignore any terrain feature that could interfere with sound pressure waves as they travel
17 from the turbines to homes in the project area. This is also conservative. In addition, HDR
18 programmed Cadna-A to assume that the agricultural fields were only 70% acoustically
19 absorptive based on the "Noise Guidelines for Wind Farms" document published by the Ontario
20 Ministry of the Environment. In effect this assumes 70% of the ground cover is porous, or
21 acoustically absorptive, and 30% of the ground is an exposed hard surface, or acoustically
22 reflective. This is also conservative.

23 **Q: What did the modeling show?**

1 A: HDR modeled noise levels from all proposed wind turbines operating in their loudest
2 operational state. The average mean and median noise levels across all receptors, from all wind
3 turbines in the proposed Project, operating simultaneously at their highest rated operating speed,
4 were both calculated to be 31 and 32 dBA respectively. These average and median figures are
5 lower than the existing ambient sound conditions measured in our noise study. The maximum
6 noise level from all wind turbines is calculated to be 43 dBA at the nearest noise-sensitive
7 receptor. That maximum is well – below the MPCA nighttime L50 noise limit of 50 dBA, and
8 satisfies the 5 dB buffer for low-frequency noise suggested by the Minnesota Department of
9 Health. These wind turbine noise levels at any residence are compatible with criteria from
10 Minnesota State Noise Pollution Control Rules 7030.0040 for acceptable levels of noise within
11 residential land uses. As stated earlier, a change of 7 decibels is very clearly discernable to a
12 person with average hearing sensitivity. Therefore the 7 dB margin between the maximum
13 levels calculated in the model (43 dBA) and the MPCA noise standards (50 dBA), is a
14 meaningful and noticeable difference.

15 **Q: How close is the nearest receptor to a wind turbine??**

16 A: According to the information provided to HDR by Goodhue Wind, LLC and used in
17 HDR's noise assessment, the closest distance between an existing home and a proposed turbine
18 is 351 meters or 1152 feet.

19 **Q: Did you prepare a written report of your work?**

20 A: Yes, we did. HDR's report is included as AWA Ex. 6-A.

21 **III. CONCLUSION**

22 **Q: Does this conclude your testimony?**

23 A: Yes it does.