

February 18, 2015

To: The Residents of Livingston County, Illinois

Re: Noise Review  
Pleasant Ridge Wind Energy Project

Dear Residents of Livingston County, Illinois:

I respectfully submit this review of the proposed Pleasant Ridge Wind Energy Project.

I am a Member of the Institute of Noise Control Engineering (INCE) since 1993 and a Full Member of the Acoustical Society of America (ASA), with over thirty years of experience in acoustics, including many years working in industrial power generation noise control and, extensive experience, measurement, and expert testimony on wind turbine noise and community reaction. INCE's guiding requirement for its members is encoded in the INCE Canon of Ethics, which states, "*Hold paramount the safety, health and welfare of the public.*" I am entrusted by INCE membership to protect public health, observe law, and call attention to actions and conditions that could adversely affect the safety, health, and welfare of people.

This review examined the "Application for County Site Approval" dated August 20, 2014, and the subsequent "Supplement" dated October 15, 2014. A supporting document for noise levels at the California Ridge Wind facility was also reviewed. Applicable law sections reviewed included Livingston County Wind Energy Noise Regulation (Attachment 1), Illinois Compiled Statute regulating county standards for wind farms (55 ILCS 5/5-12020, Attachment 2), and Illinois Noise Regulations, Title 35: Environmental Protection, Subtitle H: Noise, Chapter I: Pollution Control Board, Sections 900.101, 900.102, 900.104, and noise limits in 901.102 (Attachment 3).

The documents appeared well written and responded to portions of Illinois regulations. However, careful reading revealed that the application is *deficient*, as detailed below and summarized in Table 1. Attachments are provided for documentation.

### Review Findings

#### 1. Illinois law Chapter 35, Section 901.102: Noise level predictions insufficient

- 1.1 No safety margin found for controlling noise levels higher nearer property lines versus locations where predicted (houses); **155 non-participating properties found with levels above legal limits**; see Figures 1-1, 1-2, and 1-3 and Attachment 6 in this letter.
- 1.2 No room for error; predicted levels exactly at octave band noise limit; prediction method has a +/-3dB uncertainty out to 1000m; levels can be over Illinois noise limits.
- 1.3 No accounting found of manufacturer's batch uncertainty in dB (IEC 61400-14);
- 1.4 No margin found for increased noise levels due to downwind turbulence for turbines within 7 diameters; can be several decibels over no-turbulence manufacturer tests;
- 1.5 No facility design margin found; would be used to *ensure* compliance with Illinois law.

2. Illinois law Chapter 35, Section 900.102: **not addressed**; application omitted information necessary for the Zoning Board to assess for permit as suitable for enjoyment of life.

- 2.1 Illinois case law (see Attachment 4) affirms facilities must comply with Illinois regulations Section 900.102, which prohibits noise pollution explicitly defined as *“the emission of sound that unreasonably interferes with the enjoyment of life or with any lawful business or activity.”* The application is deficient by failing to mention or prove compliance with Section 900.102 as it pertains to preventing noise pollution.
- 2.2 The project appears certain to breach Chapter 35 Section 900.102. See Figure 2-1.
- 2.3 The application’s supporting document (California Ridge facility [1]) confirms: *noise levels predicted for Pleasant Ridge are associated with **home abandonment**.* See Attachment 7 with list of homes from Supplement of October 2014.
- 2.4 Human health hazard breaching enjoyment of life not addressed (see below).
- 2.5 Independent analysis shows that predicted noise levels at neighbor homes will exceed those that unreasonably interfere with the enjoyment of life (see Attachment 5.)

3. Risk of regulatory default not assessed

The facility appears certain to result in default under County **Sec. 56-625**. By not disclosing the limited options for wind turbine noise control (smaller size or sufficient distance during permitting, or shutdown if complaints during operation), the application can mislead the reader into thinking there are other useful noise control options available after construction. Do unanticipated costs create future economic harm for the County residents? Examples:

- 3.1 Falmouth, MA: Recently due to wind turbines exceeding predicted levels and regulatory limits, Falmouth, Massachusetts had to shut turbines OFF at night and Sundays by court order. Extensive costs of litigation and reduced income.
- 3.2 Fairhaven, Massachusetts and Kingston, Massachusetts. Similarly, following MADEP testing and legal action, these towns are shutting turbines OFF during night hours.
- 3.3 Mason County, Michigan. Operating test data for the Lake Wind Energy Park in Mason County, Michigan in 2014 showed 1) facility exceeded regulatory limits at power levels above 1/3-1/2 power, and 2) revealed that the only way to reduce noise to meet the regulatory limits was to drop turbine power below one-third power (effectively OFF).

4. Human health hazard not considered

Following complaints, appeals to stop the noise, and home abandonments, cooperative acoustic testing was conducted in Shirley Wisconsin in 2012 [2]. Additional extensive independent acoustic surveys were conducted in 2013-2014 by E-Coustic Solutions, Okemos, Michigan and reports prepared revealing continuing infrasonic pressure pulsations during wind turbine operations and not present when turbines idle, consistent with Shirley analysis.

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1 Noise Level Compliance Analysis for the California Ridge Wind Energy Project Vermillion County, Illinois, March 7, 2014.

2 Channel Islands Acoustics, Camarillo, CA, Principal: Dr. Bruce Walker; Hessler Associates, Inc., Haymarket, VA Principals: George F. and David M. Hessler; Rand Acoustics, Brunswick, ME, Principal: Robert Rand; Schomer and Associates, Inc., Champaign, IL, Principal: Dr. Paul Schomer, "A Cooperative Measurement Survey and Analysis of Low Frequency and Infrasound at the Shirley Wind Farm in Brown County, Wisconsin", PSC REF#:178263, December 24, 2012.

On October 13, 2014, two days prior to the Pleasant Ridge Supplement, the Brown County Wisconsin Board of Health declared the Shirley Wind Farm a “human health hazard.” The Board declared the wind turbines at the Shirley Wind Project in Glenmore, Wisconsin “*a human health hazard for all people exposed to infrasound (low frequency noise) and other emissions potentially harmful to human health. ... The Board’s Oct. 13 decision was based on a year-long study documenting infrasound in homes within a six mile radius of the Shirley Wind turbines. Duke Energy ... will be asked to convince the Board Shirley Wind is not causing health problems. If Duke fails, it may face a shutdown order*” [3].

Audible sound levels at Shirley are similar to those at California Ridge and predicted for Pleasant Ridge. There is no discussion presented in the application to expect different results at Pleasant Ridge. The Pleasant Ridge application and supplement dated October 15, 2014 failed to show how the proposed Pleasant Ridge facility is designed to prevent a health hazard condition.

### Summary

This professional caution is provided with the express intent to observe the law and protect the safety, health, and welfare of the residents in the vicinity of the proposed facility.

In my professional opinion, the sum of the deficiencies found in the application and further independent analysis makes clear that this facility, as proposed, appears certain to breach Illinois law. The proposed Pleasant Ridge Wind Project appears certain to exceed Illinois law noise limits (re 901.102) in 155 non-participating properties and cause adverse impacts to enjoyment of life (re 900.102) including sleep interference to possible home abandonment in an area encompassing hundreds of homes throughout some 141 square miles, with the severest impacts expected closer to the turbines where the noise levels are louder. Regulatory default (County Sec. 56-625) appears certain. This is a staggering degree of environmental noise pollution and breach of law with no apparent justification.

Thank you for your consideration of this review. Please contact me if you have any questions.

Respectfully submitted,

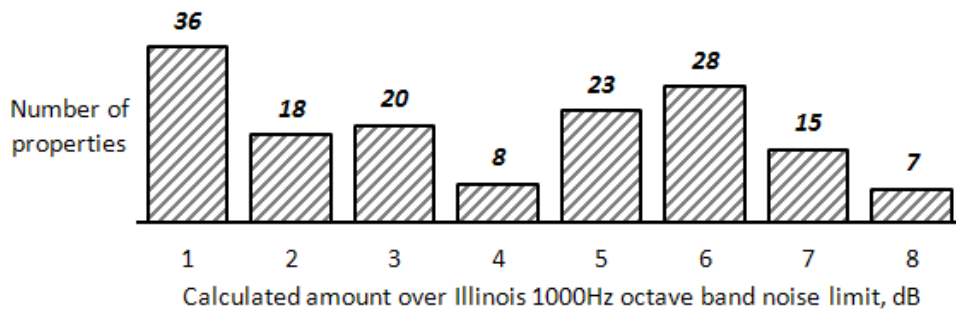
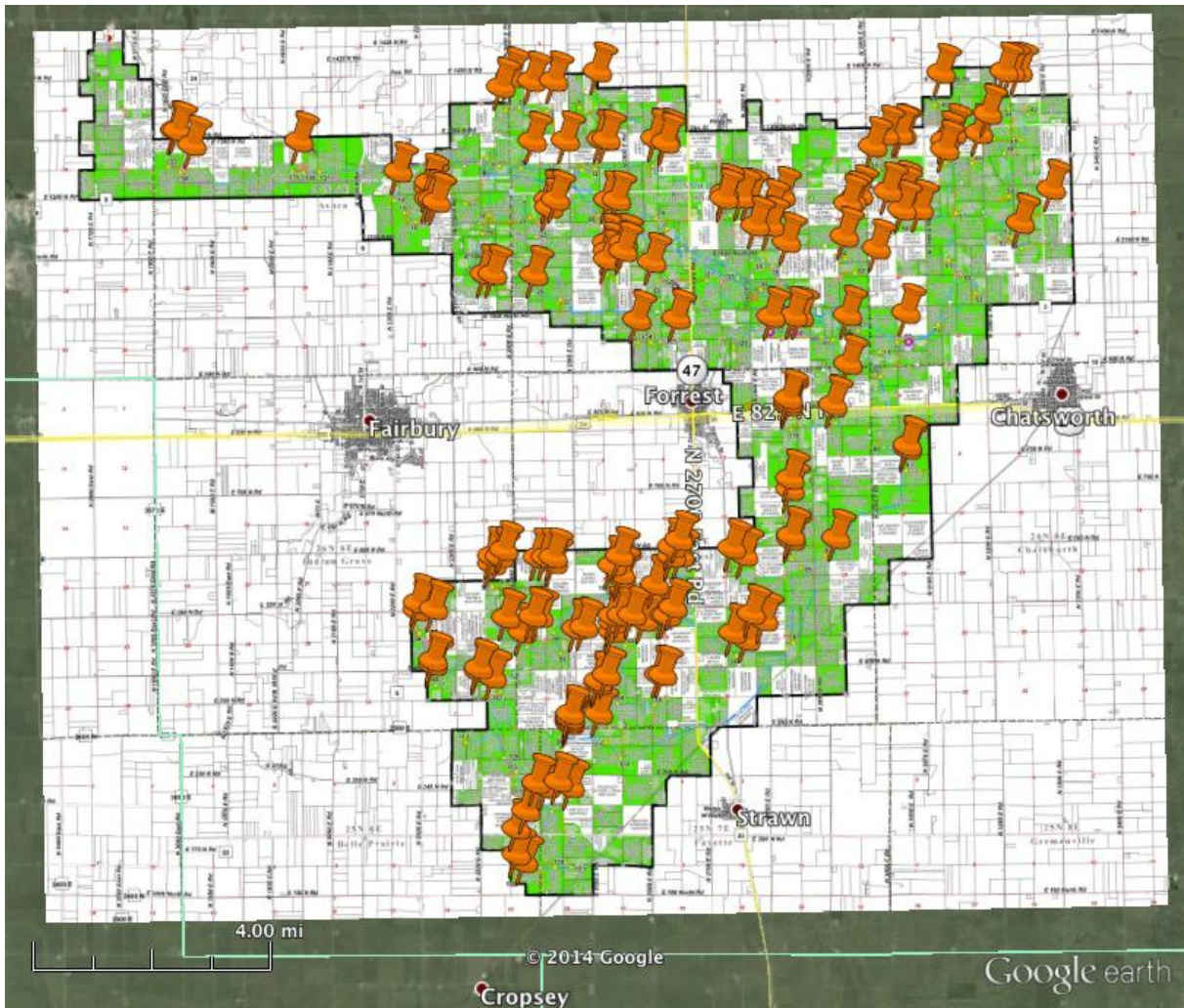


Robert W. Rand, ASA, INCE

Table 1. Summary of acoustic review for compliance with Illinois noise regulations.

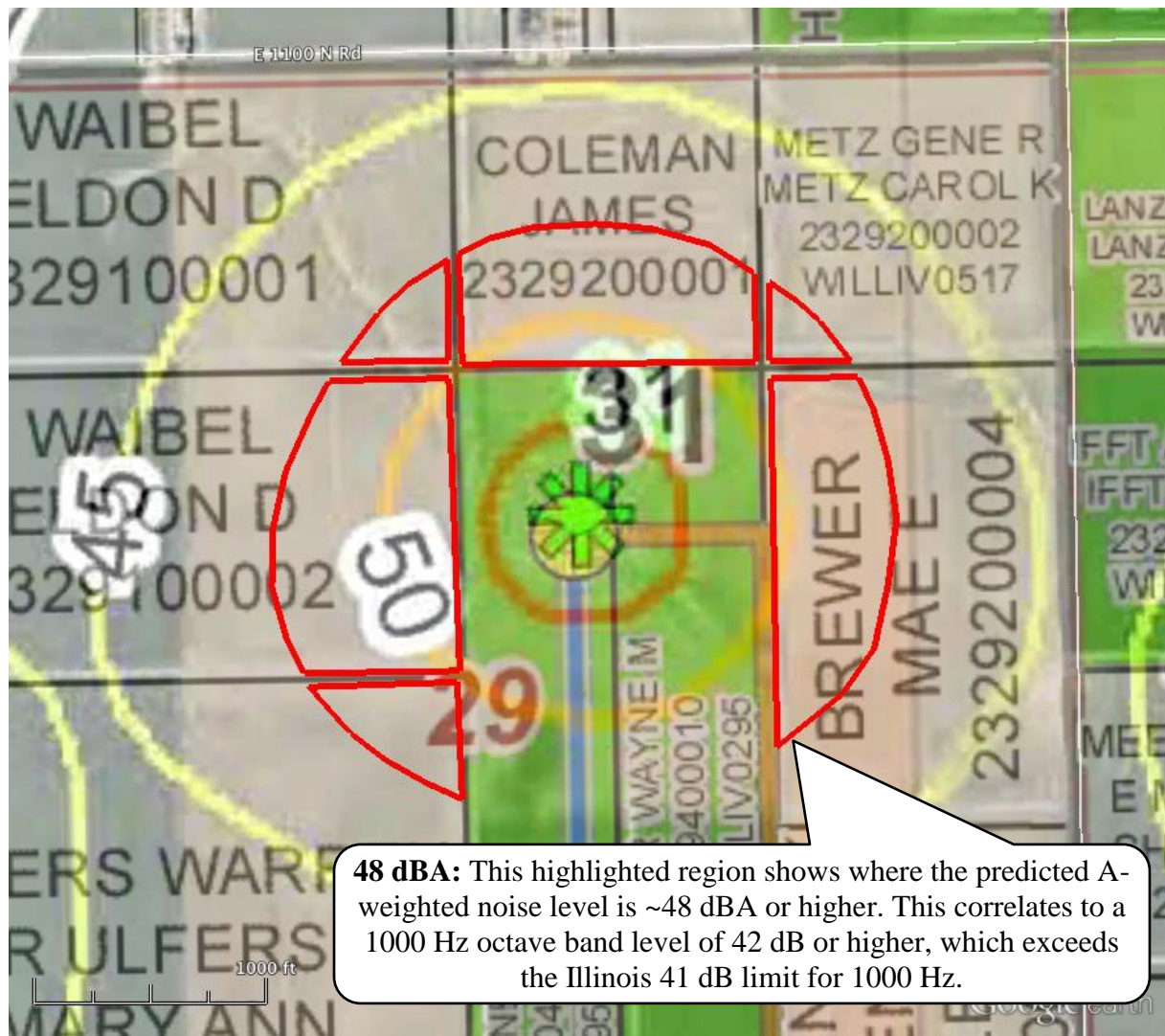
Applicable State Regulation:	Chapter 35, Section 900.102	Chapter 35, Section 901.102
Application:	Prohibition of Noise Pollution	Sound Emission Standards
Text:	“No person shall cause or allow the emission of sound beyond the boundaries of his property, as property is defined in Section 25 of the Illinois Environmental Protection Act, so as to cause noise pollution in Illinois, or so as to violate any provision of this Chapter.”	<p><i>See 901.201(a) [day]                  Octave band Leq1hr limits                  Maximum permitted sound level approximates 51 dBA</i></p> <p><i>See 901.102(b) [night]                  Octave band Leq1hr limits                  Maximum permitted sound level approximates 46 dBA</i></p>
Reference definitions:	“Noise pollution: the emission of sound that unreasonably interferes with the enjoyment of life or with any lawful business or activity.”	<p>Daytime hours: 7:00 am to 10:00 pm, local time.</p> <p>Nighttime hours: 10:00 pm to 7:00 am, local time.</p>
Affirmed in case law?	yes	yes
Cited in application?	<b>NO.</b>	yes
Application assures compliance?	<p><b>NO.                  BREACH OF LAW                  APPEARS CERTAIN.</b></p> <p><i>1. Noise levels documented in supporting report are associated with <b>home abandonment following appeals to stop the noise.</b></i>  <i>2. Predicted noise levels exceed WHO sleep disturbance threshold and Hessler wind turbine criteria.</i>  <i>3. Predicted levels <b>exceed</b> low frequency nuisance criteria.</i>  <i>4. Predicted noise levels appear certain to <b>exceed</b> Danish indoor limits for industrial wind turbines.</i></p>	<p><b>NO.                  BREACH OF LAW                  APPEARS CERTAIN.</b></p> <p><i>1. Predicted noise levels exactly at upper limit, no design margin, no room for error; were made at homes, appreciable distance away from property lines (<b>155 properties found with noise levels above limits</b>).</i>  <i>2. No evidence of operating decibel margin for downwind turbulence within 7 blade diameters of other turbines.</i>  <i>3. No facility design decibel margin found to assure compliance.</i></p>

Figure 1-1. Properties with predicted facility noise levels above Illinois law limits.



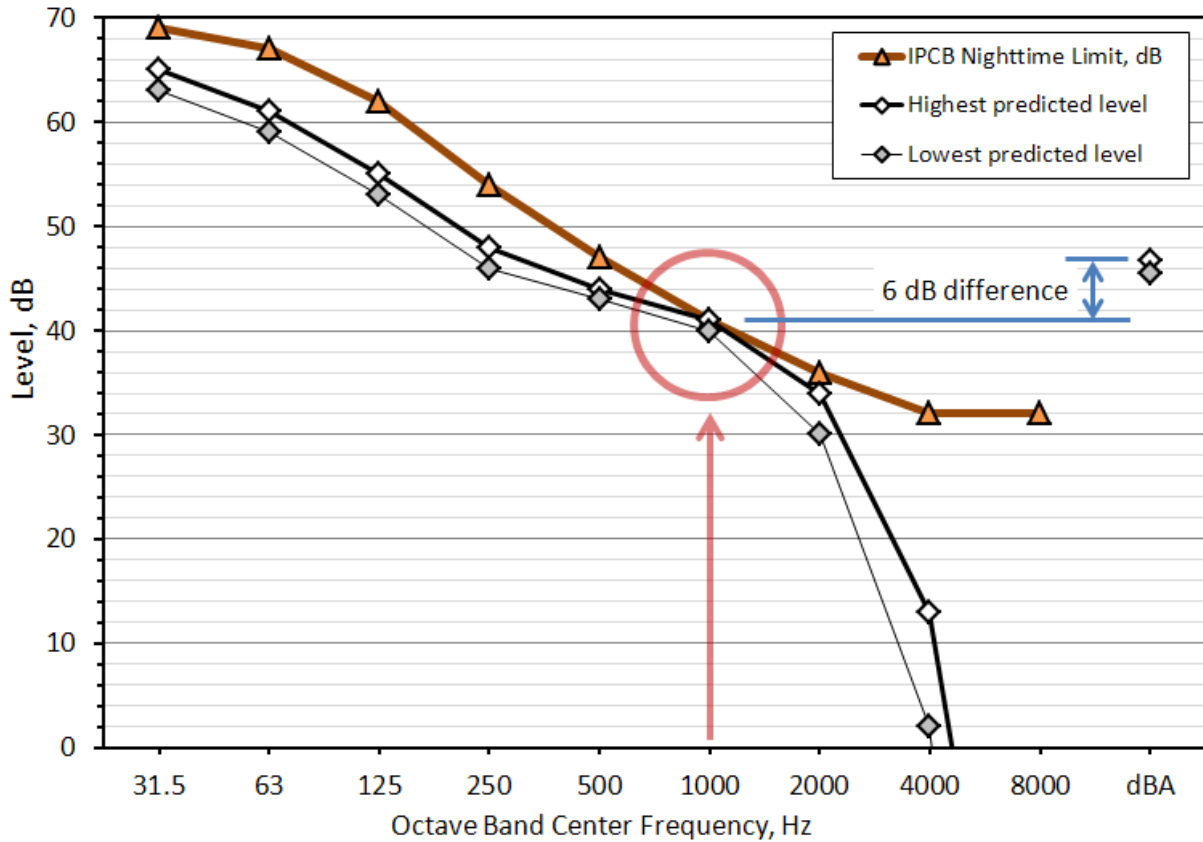
Notes: Orange pins denote 155 non-participating properties with predicted noise levels appearing certain to exceed the Illinois 1000 Hz octave band noise limit. Applicant did not provide 1000 Hz 1-dB noise contours. Map computed after observing consistent 6 dB difference between 1000 Hz and dBA levels at nearest residences. Locations on lots with levels 48 dBA and higher counted as exceeding 41 dB noise limit for 1000 Hz. Facility plan from Invenergy Application\_Supplement-Electronic-Version.pdf 16Oct2014. Noise level data from Stantec document PleasantRidge-\_Sound100m L33 Mapbook 112514.pdf 3Dec14, Figures 1-5.

Figure 1-2. Zoomed example: Properties with predicted noise levels above Illinois law limit.



Notes: In this example close-up of the site plan and predicted contours, six non-participating properties around T31 are shown flagged with predicted noise levels above 48 dBA. . (Dimensions and distances approximate.) Illinois law requires compliance with its noise limits at all locations in a property receiving the noise emissions; not just at a home. The application only considered noise levels at residences. The review indicates 155 non-participating properties with large areas with noise levels higher than permitted by Illinois law.

Figure 1-3. Relative dB offset between predicted dBA and 1000 Hz octave band levels.



Notes:

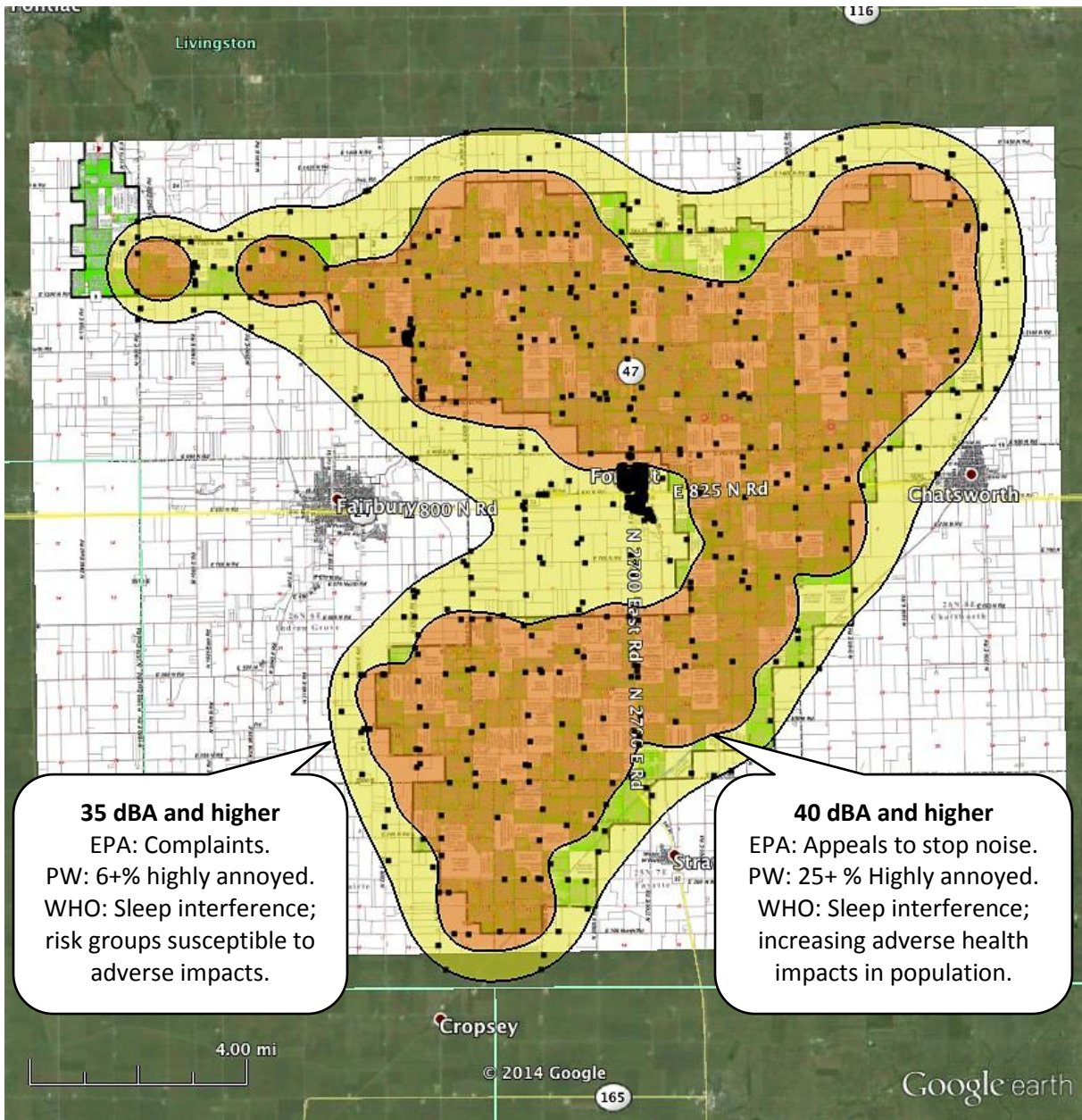
The A-weighted sound level was calculated from the predicted octave band sound levels provided for the application. A consistent offset of 6 dB between the A-weighted and 1000 Hz octave band sound levels was found for the 30 nearest non-participating residences. The predictions place the 1000 Hz band level at 40-41 dB with the Illinois limit at 41 dB. The A-weighted sound level (dBA) is 46-47 dBA for the same 30 residences. The application considered octave band sound levels only at residence locations, but Illinois law requires the law be met *at all locations on a receiving property* [4]. Any location with an A-weighted sound level higher than 47 (48 dBA or higher) would have a 1000 Hz octave band levels higher than 41; 42 or higher.

For non-participating property locations where predicted dBA levels are 4 dB or more above 47 (51 or higher), it appears the facility will exceed limits in the 500 Hz band as well, and for some, the 2000 Hz band as well. These 500 and 2000 Hz band exceedences appear certain in some 70 or more non-participating properties.

So-called noise reduction operations (NRO) are generally limited to a range of 1-4 dB.

4 “when measured at any point within such receiving Class A land, provided, however, that no measurement of sound pressure levels shall be made less than 25 feet from such property-line-noise-source”, Section 901.102 Sound Emitted to Class A Land.

Figure 2-1. Community noise impact review (re 900.102); noise contours and home locations.



dBa footprint	Area, sq. mi.	Area, acres	Homes	People
35	141.9	90,809	862	2155
40	86.3	55,200	312	780

Notes: Black squares are residence locations conveyed to reviewer as of report date. Assumed 2.5 persons per household. Facility plan from Invenergy *Application\_Supplement-Electronic-Version.pdf* 15Oct2014. Noise level data from Stantec document *PleasantRidge\_Sound100m L33 Mapbook 112514.pdf* 3Dec14, Figures 1-5. EPA: 550/9-74-004, March 1974; normalized to rural area. PW: Pedersen, E. and K. Pedersson Waye, Perception and annoyance due to wind turbine noise: A dose-response relationship, *Journal of the Acoustical Society of America* 116, 2004. WHO: *Night Noise Guidelines For Europe*, 2009, ISBN 9789289041737.



**Attachment 1. Livingston County Wind Energy Noise Regulation (applicable sections).**

**ARTICLE VIII. - WIND ENERGY**

**FOOTNOTE(S):**

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**Editor's note**— This article was formerly referred to as Annex 1 of the Livingston County Zoning Ordinance.

**State Law reference**— Wind farms, 55 ILCS 5/5-12020

**Sec. 56-618. - Design and installation.**

...

(h) *Setbacks.*

(1) All WECS towers shall be set back three times the height of the tower or 1,200 feet, whichever is greater, from any primary structure. The distance for the above setback shall be measured from the point of the primary structure foundation closest to the WECS tower to the center of the WECS tower foundation. The owner of the primary structure may waive this setback requirement; but in no case shall a WECS tower be located closer to a primary structure than 1.10 times the WECS tower height. WECS tower height means the distance from the rotor blade at its highest point to the top surface of the WECS foundation.

(2) All WECS towers shall be set back a distance of at least 1.10 times the WECS tower height from public roads, third party transmission lines, and communication towers. The county may waive this setback requirement. WECS tower height means the distance from the rotor blade at its highest point to the top surface of the WECS foundation.

(3) All WECS towers shall be set back a distance of at least 1.10 times the WECS tower height from adjacent property lines, as measured from the closest edge of the tower structure. The affected adjacent property owner may waive this setback requirement. WECS tower height means the distance from the rotor blade at its highest point to the top surface of the WECS foundation.

(4) An incorporated village or municipality must approve of the location of any tower to be located within 1.5 miles of the corporate limits of such incorporated village or municipality.

(5) No part of a WECS tower or foundation shall encroach on a public or private sewage disposal (septic) system.

(i) *Compliance with additional regulations.* Nothing in this article is intended to preempt other applicable state and federal laws and regulations.

(Res. of 1-12-2006, § VI)

**Attachment 1. (continued)**

**Sec. 56-620. - Noise levels.**

Noise levels from each WECS or WECS project shall be in compliance with applicable state pollution control board (IPCB) regulations. The applicant, through the use of a qualified professional, as part of the siting approval application process, shall appropriately demonstrate compliance with the noise requirements of this section. Thereafter, the WECS project shall be in compliance with applicable IPCB regulations throughout the entire operation period of the WECS project.

*(Res. of 1-12-2006, § VIII)*

**Sec. 56-625. - Remedies.**

(a) The applicant's, owner's, or operator's failure to materially comply with any of the provisions of this article shall constitute a default under this article.

(b) Prior to implementation of the existing county procedures for the resolution of such defaults, the appropriate county body shall first provide written notice to the owner and operator, setting forth the alleged defaults. Such written notice shall provide the owner and operator a reasonable time period, not to exceed 60 days, for good faith negotiations to resolve the alleged defaults.

(c) If the county determines in its discretion, that the parties cannot resolve the alleged defaults within the good faith negotiation period, the existing county ordinance provisions addressing the resolution of such defaults shall govern.

*(Res. of 1-12-2006, § XIII)*

**Attachment 2. Illinois Compiled Statute regulating county standards for wind farms.**

(55 ILCS 5/5-12020)

Sec. 5-12020. Wind farms. A county may establish standards for wind farms and electric-generating wind devices. The standards may include, without limitation, the height of the devices and the number of devices that may be located within a geographic area. A county may also regulate the siting of wind farms and electric-generating wind devices in unincorporated areas of the county outside of the zoning jurisdiction of a municipality and the 1.5 mile radius surrounding the zoning jurisdiction of a municipality. There shall be at least one public hearing not more than 30 days prior to a siting decision by the county board. Notice of the hearing shall be published in a newspaper of general circulation in the county. Counties may allow test wind towers to be sited without formal approval by the county board. Any provision of a county zoning ordinance pertaining to wind farms that is in effect before the effective date of this amendatory Act of the 95th General Assembly may continue in effect notwithstanding any requirements of this Section.

A county may not require a wind tower or other renewable energy system that is used exclusively by an end user to be setback more than 1.1 times the height of the renewable energy system from the end user's property line.

(Source: P.A. 95-203, eff. 8-16-07; 96-306, eff. 1-1-10; 96-566, eff. 8-18-09; 96-1000, eff. 7-2-10.)

**Attachment 3. Applicable Illinois state regulations, noise.**

**ILLINOIS NOISE REGULATIONS  
TITLE 35: ENVIRONMENTAL PROTECTION  
SUBTITLE H: NOISE  
CHAPTER I: POLLUTION CONTROL BOARD**

**Section 900.101 Definitions**

Except as hereinafter stated and unless a different meaning of a term is clear from its context, the definitions of terms used in this Chapter shall be the same as those used in the Environmental Protection Act. All definitions of acoustical terminology shall be in conformance with those contained in American National Standards Institute (ANSI) §1.1 - 1960 "Acoustical Terminology." As used in 35 Ill. Adm. Code 900 through 905, the following terms mean:

*(selected definitions shown here for this review)*

A-Weighted Sound Level: dB(A), in decibels, a frequency weighted sound pressure level, determined by the use of the metering characteristics and A-weighted network specified in ANSI §.4-1971 (R. 1976) "Specification for Sound Level Meters" and the latest revisions thereof.

ANSI: American National Standards Institute or its successor bodies.

Background Sound Level: the A-weighted sound level, measured in accordance with the procedures specified in Section 900.103, which is exceeded 90 percent of the time during the period of observation, during which sounds from motor racing facilities are inaudible. The period of observation need not necessarily be contiguous; however, the period of observation must be at least of 10 minutes duration.

Daytime hours: 7:00 am to 10:00 pm, local time.

dB(A): see "A-weighted Sound Level."

Decibel (dB): a unit of measure, on a logarithmic scale to the base 10, of the ratio of the magnitude of a particular sound pressure to a standard reference pressure, which, for purposes of this Chapter, shall be 20 micronewtons per square meter (uN/m<sup>2</sup>).

Fast Dynamic Characteristic: the dynamic characteristic specified as fast in ANSI §1.4-1971 (R. 1976) "Specification for Sound Level Meters" and the latest revision thereof.

Fast meter response: as specified in ANSI §1.4-1971, or subsequent revisions.

**Attachment 3 definitions (continued.)**

Impulsive sound: either a single pressure peak or a single burst (multiple pressure peaks) for a duration usually less than one second. Examples of impulsive sound sources are a drop forge hammer and explosive blasting.

Leq: equivalent continuous sound pressure level in decibels: ten times the logarithm to the base ten of the ratio of a time-mean-square sound pressure to the square of reference sound pressure. The reference pressure is 20 micronewtons per square meter.

Nighttime hours: 20:00 pm to 7:00 am, local time.

**Noise pollution: the emission of sound that unreasonably interferes with the enjoyment of life or with any lawful business or activity. [*emphasis by reviewer.*]**

Octave band sound pressure level: the sound pressure level for the sound being measured contained within the specified octave band. The reference pressure is 20 micronewtons per square meter.

Person: any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, agency, political subdivision of this State, any other State or political subdivision or agency thereof or any legal successor, representative, agent or agency of the foregoing.

Preferred frequencies: those frequencies in Hertz preferred for acoustical measurements which, for the purposes of this Chapter, consist of the following set of values: 20, 25, 31.5, 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, 10,000, 12,500.

Prominent discrete tone: sound, having a one-third octave band sound pressure level which, when measured in a one-third octave band at the preferred frequencies, exceeds the arithmetic average of the sound pressure levels of the two adjacent one-third octave bands on either side of such one-third octave band by:

5 dB for such one-third octave band with a center frequency from 500 Hertz to 10,000 Hertz, inclusive. Provided: such one-third octave band sound pressure level exceeds the sound pressure level of each adjacent one-third octave band, or;

8 dB for such one-third octave band with a center frequency from 160 Hertz to 400 Hertz, inclusive. Provided: such one-third octave band sound pressure level exceeds the sound pressure level of each adjacent one-third octave band, or;

15 dB for such one-third octave band with a center frequency from 25 Hertz to 125 Hertz, inclusive. Provided: such one-third octave band sound pressure level exceeds the sound pressure level of each adjacent one-third octave band.

**Attachment 3 (continued.)**

Property-line-noise-source: any equipment or facility, or combination thereof, which operates within any land used as specified by 35 Ill. Adm. Code 901.101. Such equipment or facility, or combination thereof, must be capable of emitting sound beyond the property line of the land on which operated.

Residential dwelling unit: all land used as specified by Standard Land Use Coding Manual (SLUCM) Codes 110 through 190 and those portions of land used as specified by SLUCM Code 6741 used for sleeping.

Sound: an oscillation in pressure in air.

Sound level: in decibels, a weighted sound pressure level, determined by the use of metering characteristics and frequency weightings specified in ANSI §1.4-1971 "Specification for Sound Level Meters."

Sound pressure level: in decibels, 20 times the logarithm to the base 10 of the ratio of the magnitude of a particular sound pressure to the standard reference pressure. The standard reference pressure is 20 micronewtons per square meter.

Weekday: any day which occurs during the period of time commencing at 10:00 p.m. Sunday and ending at 10:00 p.m. Friday during any particular week.

Weekend day: any day which occurs during the period of time commencing at 10:00 p.m. Friday and ending at 10:00 p.m. Sunday during any particular week.

**Section 900.102 Prohibition of Noise Pollution**

No person shall cause or allow the emission of sound beyond the boundaries of his property, as property is defined in Section 25 of the Illinois Environmental Protection Act, so as to cause noise pollution in Illinois, or so as to violate any provision of this Chapter.

**Section 901.102 Sound Emitted to Class A Land**

(a) Except as elsewhere provided in this Part, no person shall cause or allow the emission of sound during daytime hours from any property-line-noise-source located on any Class A, B or C land to any receiving Class A land which exceeds any allowable octave band sound pressure level specified in the following table, when measured at any point within such receiving Class A land, provided, however, that no measurement of sound pressure levels shall be made less than 25 feet from such property-line-noise-source.

**Attachment 3 (continued.)**

Summary table of daytime noise limits. Class C Emitter to Class A receiver highlighted.

Part 901.102 - Daytime	Octave Band Center Frequencies, Hz									Calculated
Class A Receiving Land	31.5	63	125	250	500	1000	2000	4000	8000	dBA
Class C Emitter	75	74	69	64	58	52	47	43	40	60
Class B Emitter	72	71	65	57	51	45	39	34	32	55
Class A Emitter	72	71	65	57	51	45	39	34	32	55

(b) Except as provided elsewhere in this Part, no person shall cause or allow the emission of sound during nighttime hours from any property-line-noise-source located on any Class A, B or C land to any receiving Class A land which exceeds any allowable octave band sound pressure level specified in the following table, when measured at any point within such receiving Class A land, provided, however, that no measurement of sound pressure levels shall be made less than 25 feet from such property-line-noise-source.

Summary table of nighttime noise limits. Class C Emitter to Class A receiver highlighted.

Part 901.102 - Nighttime	Octave Band Center Frequencies, Hz									Calculated
Class A Receiving Land	31.5	63	125	250	500	1000	2000	4000	8000	dBA
Class C Emitter	69	67	62	54	47	41	36	32	32	51
Class B Emitter	63	61	55	47	40	35	30	25	25	44
Class A Emitter	63	61	55	47	40	35	30	25	25	44

**Section 900.104 Burden of Persuasion Regarding Exceptions**

In any proceeding pursuant to this Chapter, if an exception stated in this Chapter would limit an obligation, limit a liability, or eliminate either an obligation or a liability, the person who would benefit from the application of the exception shall have the burden of persuasion that the exception applies and that the terms of the exception have been met. The Agency shall cooperate with and assist persons in determining the application of the provisions of this Chapter.

**Attachment 4. Case law affirming law requiring compliance with Section 900.102  
(prohibits emission of sound that unreasonably interferes with the enjoyment of life).**

Ref: <http://law.justia.com/cases/illinois/supreme-court/1974/46413-6.html>

COAL OPERATORS ASS'N v. Pollution Control Bd.  
59 Ill. 2d 305 (1974)  
319 N.E.2d 782

ILLINOIS COAL OPERATORS ASSOCIATION, Petitioner, v. THE POLLUTION  
CONTROL BOARD et al., Respondents.

No. 46413.

Supreme Court of Illinois.

Opinion filed November 27, 1974.

\*306 Lord, Bissell & Brook, of Chicago (R.R. McMahan and Stephen M. Murray, of  
counsel), for petitioner.

\*307 William J. Scott, Attorney General, of Chicago (George W. Wolff, Sheldon J. Plager,  
Roger W. Findley, and Russell R. Eggert, of counsel), for respondents.

Order affirmed.

MR. JUSTICE WARD delivered the opinion of the court:

The Illinois Institute for Environmental Quality, which was created by the Environmental Protection Act (Ill. Rev. Stat. 1971, ch. 111 1/2, par. 1006), under the authority of the Act formed a Task Force on Noise in 1971 to draft suggested standards to be used for the regulation of noise. The suggestions of the Task Force, the personnel of which included members of the faculty of the University of Illinois in law, engineering and physiology and of a national acoustical consulting firm, were filed with the Illinois Pollution Control Board (the Board) early in 1972. Between June 1972 and May 1973 the Board conducted 16 public hearings throughout the State to consider the proposed regulations. The petitioner here, the Illinois Coal Operators Association, an unincorporated association of 11 coal-mining companies in Illinois, participated and offered evidence at the hearings. In July 1973 the Board adopted regulations to govern environmental noise. The Board considered that environmental noise comes from (1) stationary or "property line" sources; (2) ground transportation sources; (3) construction site sources; (4) airport sources. The regulations which were adopted concerned themselves only with category 1, stationary or "property line" sources. The respondents, the Illinois Environmental Protection Agency and the Illinois Pollution Control Board, have stated that regulations are being prepared for categories 2, 3 and 4 and at a later date those regulations will be announced.

The petitioner filed a request under the provisions of sections 29 and 41 of the Environmental Protection Act (Ill. Rev. Stat. 1971, ch. 111 1/2, pars. 1029, 1041) in the appellate court for a review of regulations which had been \*308 promulgated. These provisions state that any person "adversely affected or threatened by any rule or regulation of the Board may obtain a determination of the validity or application of such rule or regulation" by a petition for review.



**Attachment 4 (continued.)**

(Ill. Rev. Stat. 1971, ch. 111 1/2, par. 1029.) The authority of the petitioner to proceed under this section has not been questioned by the respondents and we need not discuss it. We granted the petitioner's motion to transfer the case to this court under Rule 302(b). 50 Ill.2d R. 302(b).

The first contention in the petition is basically that the Board in Rule 102 of Chapter 8 of its rules and regulations (hereafter Rule 102) has exceeded the authority to regulate which was conferred on it by the legislature.

The Board was authorized by the Environmental Protection Act to promulgate procedural and substantive regulations to govern refuse disposal and air, water, land and noise pollution. Ill. Rev. Stat. 1971, ch. 111 1/2, par. 1027.

Referring to pollution by noise, section 24 of the Act (Ill. Rev. Stat. 1971, ch. 111 1/2, par. 1024) provides:

"No person shall emit beyond the boundaries of his property any noise that unreasonably interferes with the enjoyment of life or with any lawful business or activity, so as to violate any regulation or standard adopted by the Board under this Act."

Section 25 (Ill. Rev. Stat. 1973, ch. 111 1/2, par. 1025), after authorizing the Board to adopt regulations prescribing "limitations on noise emissions beyond the boundaries of the property of any person," states: "The Board shall, by regulations under this section, categorize the types and sources of noise emissions that unreasonably interfere with the enjoyment of life, or with any lawful business, or activity, and shall prescribe for each such category the maximum permissible limits on such noise emissions."

Rule 102 of the Board, which the petitioner questions, provides:

\*309 "No person shall cause or allow the emission of sound beyond the boundaries of his property so as to cause noise pollution in Illinois, or so as to violate any provision of this Chapter [these regulations] or the Illinois Environmental Protection Act."

Rule 101(j) of Chapter 8 of the Board's rules and regulations defines noise pollution:

"The emission of sound that unreasonably interferes with the enjoyment of life or with any lawful business or activity."

The contention is that the Board is not only attempting through Rule 102 to regulate emissions of sound which unreasonably interfere with the enjoyment of life or with any lawful business or activity, as the statute (section 24) authorizes the Board to do, but also is attempting to regulate any other emission of sound which the Board may choose to prohibit.

However, Rule 102 is not, as a reasonable matter, to be given the restricted and isolated reading the petitioner would give it. The prohibition of section 24 is against causing noise emissions that unreasonably interfere with the enjoyment of life or with a lawful business or activity. The basic violation was to be unreasonably interfering through noise with the

**Attachment 4 (continued.)**

enjoyment of life or lawful activity, and it is clear that it was contemplated by the legislature that the Board would adopt standards or regulations to define or identify noise emissions which constituted such unreasonable interference. This is evidenced by section 25, which specifically states that the Board shall categorize the types and sources of noise emissions which unreasonably interfere with the enjoyment of life or lawful business activity and calls for the Board to prescribe maximum permissible limits for noise emissions.

**While Rule 102 is poorly composed, we do not consider that it should be read as the petitioner would have us do. We read it as prohibiting emissions that unreasonably interfere with life or activities, whether such emissions may be said to violate section 24 generally or \*310 whether they are emissions which more specifically may be said to violate a particular Board regulation (as referred to in section 24) by exceeding, for example, the maximum permissible decibels which may be by a regulation emitted to a certain classification of land.** The final disjunctive part of Rule 102 "or the Illinois Environmental Protection Act" must be regarded as simple surplusage. It is clear that the Board's enforcement authority is limited to cases of noise that unreasonably interfere with the enjoyment of life or with any lawful business or activity and that the Board in its regulations could not go beyond this boundary. It would be unreasonable to say the Board sought to violate the clearly announced limitations set out in section 25 on its authority to regulate. *[emphasis by reviewer.]*

Another complaint of the petitioner is that the Board has violated the legislative intention in arbitrarily imposing sound-emission limitations without regard to whether such emissions in actuality would unreasonably interfere with the enjoyment of life or any lawful business or activity. That generally stated complaint is to be answered by observing that administrative action taken under statutory authority will not be set aside unless it has been clearly arbitrary, unreasonable or capricious. (*Richards v. Board of Education*, 21 Ill. 2d 104; *People ex rel. Stephens v. Collins*, 35 Ill. 2d 499; *People ex rel. Polen v. Hoehler*, 405 Ill. 322; *Skokie Federal Savings and Loan Ass'n v. Savings and Loan Board*, 88 Ill. App.2d 373; 1 F. Cooper, *State Administrative Law* 259 (1965); 2 Cooper 791.) The Board adopted its regulations only after their having been proposed by the qualified group which composed the Task Force on Noise and its consultants and only after 16 public hearings had been held by the Board extending for a period of almost a year. We cannot say that the rules which resulted from this study are clearly arbitrary, unreasonable or capricious.

The petitioner argues, too, that one of the Board's regulations, Rule 208(d) of Chapter 8 of the rules and \*311 regulations (hereafter Rule 208(d)), violates the equal protection clauses of both the Constitution of the United States and the Constitution of Illinois. It also violates our constitution's prohibition of special legislation, they say, in that the regulation exempts sounds emitted by construction equipment from the operation of the regulations, while there is no exemption for identical equipment used in mining.

The legislature may create legislative classifications, for "perfect uniformity of treatment of all persons is neither practical nor desirable." (*Grasse v. Dealer's Transport Co.*, 412 Ill. 179,

**Attachment 4 (continued.)**

193.) A classification must not, however, be arbitrary, and it must be based on a rational difference of condition or situation existing in the persons or objects upon which the classification rests. (*Begich v. Industrial Com.*, 42 Ill. 2d 32, 35.) This was also expressed by this court in *People ex rel. County of Du Page v. Smith*, 21 Ill. 2d 572, 578, when it was said: "If there is a reasonable basis for differentiating between the class to which the law is applicable and the class to which it is not, the General Assembly may constitutionally classify persons and objects for the purpose of legislative regulation or control, and may pass laws applicable only to such persons or objects." Also, there must be a reasonable basis for the classification in view of the objects and purposes to be accomplished by the statute. (*Morey v. Doud*, 354 U. S. 457, 1 L.Ed.2d 1485, 77 S. Ct. 1344; *McDonald v. Board of Election Com'rs*, 394 U. S. 802, 809, 22 L.Ed.2d 739, 745, 89 S. Ct. 1404; *Chicago Allis Mfg. Corp. v. Metropolitan Sanitary District*, 52 Ill. 2d 320, 327, 331; *Bridgewater v. Hotz*, 51 Ill. 2d 103, 111; *Thillens, Inc. v. Morey*, 11 Ill. 2d 579, 594; *Heimgaertner v. Benjamin Electric Manufacturing Co.*, 6 Ill. 2d 152, 163.) Too, a person who attacks the validity of a classification has the burden of demonstrating that the classification is unreasonable or arbitrary. (*People v. Palkes*, 52 Ill. 2d 472, 477.) We consider that this burden has not been met by the \*312 petitioner here.

At the public hearings conducted by the Board, representatives of the petitioner testified to a great similarity between many of the activities and equipment in surface mining and construction and said it was unreasonable to distinguish between the two industries. The Environmental Protection Agency, however, argued before the Board that the similarity of some equipment was the only similarity existing between the two industries. We consider there are significant differences upon which a classification can be based. The record shows that construction work in general involves, in contrast to mining, distinctly temporary activities. Also, there was evidence presented at the hearings that over one-half of the construction activity in Illinois takes place in populous Cook County and that surface coal mining is ordinarily conducted on large tracts of land in rural areas. Only some of the equipment used in construction is used in surface mining. The two industries differ markedly in the number of persons employed. There is evidence that the mining industry in Illinois employs approximately 10,000 miners and construction provides employment for over 200,000 persons.

The respondents also point out that Rule 208(d) provides only for an exemption from the numerical limits of the noise regulations in Rules 202 to 207, inclusive, of Chapter 8. All persons, including those in the construction business, remain subject to Rules 102 and 101(j) of Chapter 8 of the Board's rules and regulations, and the respondents say that this limited exemption of the construction industry will end upon the adoption of construction-noise regulations which are now being considered.

We would also remark that so far as legislative classification is concerned, it has been recognized that evils in the same field may be of different dimensions and reform may take place one step at a time. The legislature \*313 may address itself to one stage of a problem and not take action at the same time as to other phases. *Williamson v. Lee Optical of Oklahoma*,

**Attachment 4 (continued.)**

Inc., 348 U. S. 483, 489, 99 L. Ed. 563, 75 S. Ct. 461; McDonald v. Board of Election Com'rs, 394 U. S. 802, 809, 811, 22 L.Ed.2d 739, 89 S. Ct. 1404; Chicago Allis Manufacturing Co. v. Metropolitan Sanitary District, 52 Ill. 2d 320, 331; W.F. Hall Printing Co. v. Environmental Protection Agency, 16 Ill. App.3d 864.

This exemption of construction work does not appear to be unique. The respondents note that proposed environmental regulations of the State of New York regarding noise from stationary sources would be applied to mining and quarrying noise but sounds that originate on construction sites would be exempted from the regulations. A 1973 publication of New York's Department of Environmental Conservation is quoted: "Information received at a public hearing has shown that regulation of construction noise involves several complex considerations. Because construction is a temporary activity and because the contractor is generally limited in his ability to obtain quieter equipment, a separate regulation is being developed for construction."

The final argument of the petitioner is that the Board's regulations do not adequately protect an existing land user against changes in the use of adjacent lands. A residence, for example, might be built on previously underdeveloped land next to land of an industrial land user. If that would be done, the petitioner says the adjacent industrial land user would be required to observe different and more stringent limits on noise emissions which might be "received" by the now residential property. It argues that it might be financially impossible or severely expensive for the first land user to comply with the new requirements.

The petitioner acknowledges that Rule 201(d) of Chapter 8 of the Board's rules and regulations provides:

\*314 "A parcel or tract of land used as specified by SLUCM [Standard Land Use Code Manual of the U.S. Department of Transportation] Code 81 [agricultural uses], 83 [forestry activities], 91 [undeveloped, unused land], or 922 [nonreserve, undeveloped forests], when adjacent to Class B [commercial] or C [industrial] land may be classified similarly by action of a municipal government having zoning jurisdiction over such land. Notwithstanding any subsequent changes in actual land use, land so classified shall retain such B or C classification until the municipal government removes the classification adopted by it.

They recognize, too, that the Board has observed:

"This provision was designed to reassure developers of `B' or `C' properties that they would not be subjected to development of adjacent properties that could entail noise restrictions beyond that originally contemplated at the time of original development."

They say, however, that the safeguard or protection provided land users by Rule 201(d) is illusory because in rural areas, where they principally operate, there seldom is zoning activity by local governments. The respondents, however, correctly note that the protection available under the rule does not depend upon the land of the land user being already zoned. The reference in the rule is to zoning jurisdiction.

**Attachment 4 (continued.)**

There is a source of protection for the land user, too, from the statute's directing the Board to consider the "question of priority of location in the area involved" and the "social and economic value of the pollution source" in enforcement proceedings. (Ill. Rev. Stat. 1973, ch. 111 1/2, par. 1033(c).) Too, the Act provides for the granting of variances when compliance with regulations "would impose an arbitrary or unreasonable hardship." Ill. Rev. Stat. 1973, ch. 111 1/2, par. 1035.

We consider that the questions raised by the petitioner are without substantial validity, and the order of the Pollution Control Board is affirmed.

Order affirmed.

Attachment 5. Additional commentary and analysis.

**Summary of contents:**

5.1 Low frequency noise inside homes, Lpa,LF breaches Danish limits for prevention of annoyance.

***Finding: For essentially all nearby neighbors, the project is expected to exceed the indoors low frequency noise limit of 20 dB,Lpa,LF set in Denmark law established to prevent nuisance and adverse health impacts. The proposed project appears certain to breach Illinois law Chapter 35, 900.102 by affecting enjoyment of life.***

5.2 C-weighted sound levels guidelines breached by proposed facility.

***Finding: For essentially all nearby neighbors, the project is predicted to exceed by several or more decibels, the Hessler 60dBC criteria to protect residential areas against low frequency noise problems. The proposed project appears certain to breach Illinois law Chapter 35, 900.102 by adversely affecting enjoyment of life.***

5.3 Project A-weighted sound levels exceed guidelines for complaints and health impacts.

***Finding: For all nearby neighbors, the project is predicted to exceed by several or more decibels, the WHO 40 dBA sleep disturbance threshold and other 35-40 dBA limits identified by Hessler to prevent nuisance. The proposed project appears certain to breach Illinois law Chapter 35, 900.102 by adversely affecting enjoyment of life.***

Attachment 5.1 Low frequency noise inside homes, Lpa,LF breaches Danish limits for prevention of annoyance.

Officials reviewing wind turbine proposals need to consider strong low frequencies for causing an adverse public reaction. Wind turbines have proven to be a significant source of low frequency energy.

The Application was silent on the potential for low frequency noise impacts and public nuisance complaints. Wind turbine low frequency noise warnings were first recognized in the 1980s. The potential for adverse low frequency community noise impacts from wind turbines has been documented and published by acoustic researchers, including the US Department of Energy [5].

Thus much has been learned on the community response to large industrial wind turbines prior to issuance of the Application. The following discussion addresses a method for assessing impacts of low frequency noise emissions, which are demonstrated to be audible and capable of creating a nuisance at residences near the Pleasant Ridge Wind Project.

*Low frequency impact analysis: Danish Lpa,LF standard*

Denmark has a long and well-established history with wind turbines. It is well known that recent replacement of older, smaller wind turbines with newer, larger industrial wind turbines has provoked community resistance and complaints. The Danish Ministry of Health has an industrial, indoors low frequency night noise limit of 20 Lpa,LF (10-160 Hz A-weighted one-third octave bands) which provides an established metric for assessing for and preventing potential low frequency noise disturbance indoors. In 1999 the Dutch Foundation for Noise Nuisance (NSG) published a guideline for low frequency noise [6] which became a basis for case law. The criteria are based on hearing thresholds for the 10% most sensitive people in an ontologically unselected population aged 50-60 years. These 10% thresholds are typically about 4-5 dB lower than the average threshold for ontologically normal young adults (18-25 years) as given in ISO 226. Denmark extended the law to regulate industrial wind turbines effective January 1, 2012.

***While the Danish industrial and wind turbine indoors noise limit (20 Lpa,LF) is not codified in Illinois law, it serves very well as an established guideline, based on medical science, for preventing annoyance and impacts on enjoyment of life. Breaches of this limit are indicative of certainty for breaching Illinois Chapter 35, Section 900.102.***

For this review, low frequency noise emissions from the proposed project were assessed by using the Application's predicted octave band sound levels outdoors at homes. To determine indoors noise levels, house noise reduction is factored in. Example house noise reductions used in the Danish law are under controversy as they allow higher interior sound levels a

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5 Kelley, N., "A Proposed Metric for Assessing the Potential of Community Annoyance from Wind Turbine Low-Frequency Noise Emissions". US Department of Energy, Contract No. DE-AC02-83CH1 0093, November 1987, Presented at the Windpower '87 Conference and Exposition, October 5-8, 1987.

6 G.P. van den Berg, "Assessment Of Low Frequency Noise Complaints", Science Shop for Physics, University of Groningen, Presented At Internoise '99.

percentage of the time [7]. For this analysis, house noise reduction values were taken from the Epsilon 2006 study Table 4.3-1 [reference 8, tests at an operating wind turbine facility]. Octave band noise reduction values were estimated at 10, 15, and 19 dB for the 31, 63, and 125 Hz bands, respectively (covering to side frequencies 22-177 Hz, most of the Lpa,LF’s 7 to 177Hz range). The computed indoors octave band set for 31, 63, and 125 Hz at each Residence was A-weighted and summed logarithmically to estimate the indoors Lpa,LF noise level. The results for 106 homes near the proposed project are shown in Table A5.1-1 below.

***Finding: For essentially all nearby neighbors, the project is expected to breach the indoors low frequency noise limit of 20 dB, Lpa,LF set in Denmark law established to prevent nuisance and adverse health impacts. The proposed project appears certain to breach Illinois law Chapter 35, 900.102 by affecting enjoyment of life.***

Table A5.1-1. Summary of indoors Lpa,LF low frequency noise levels at nearby homes.

<b>Residence #</b>	<b>Total number of residences</b>	<b>Lpa,LF indoors noise level (extent for all residences)</b>	<b>Breaches Danish wind turbine indoors noise limit set to prevent nuisance?</b>
R-005 – R-773*	104	21-24	<b>YES</b>
R-773	1	20	At limit
R-041	1	19	No

\* Inclusive excepting homes noted in subsequent rows. Of the total 106 homes, 34 are listed as “Participant”.

7 Henrik Møller, Steffen Pedersen, Kerstin Persson Waye, and Christian Sejer Pedersen, “Comments to the article “Sound insulation of dwellings at low frequencies”, Journal of Low Frequency Noise, Vibration and Active Control, Vol. 30 No. 2 2011. “The Danish Environmental Protection Agency measurements of sound insulation is fundamentally wrong, and the data should be discarded.”

8 "A Study of Low Frequency Noise and Infrasound from Wind Turbines", Epsilon Report No. 2433-01, 2006.



5.2 C-weighted sound levels guidelines breached by proposed facility.

From [9], it is known that acoustical consultant George Hessler “considered that his experience since 1971 had shown that the recommendation of ANSI B133.8 was “woefully inadequate” for protecting residential areas against low frequency noise problems and that the problem continued to occur for combustion turbine open cycle plants. He [Hessler] therefore proposed C-weighted SPLs supplementary to the A-weighted site criteria .... These levels contained no factor of safety or margin of error and Hessler cautioned that these levels should be considered the maximum allowable. Hessler has since clarified [10] that his criteria are all in terms of the C-weighted Leq.” Hessler’s maximum allowable dBC limits are shown below. The applicable limit is 60 dBC for extensive or 24/7 source operation in very quiet rural areas.

	For normal suburban/ urban residential areas, daytime residual level, L90>40dBA	For very quiet suburban or rural residential areas, daytime residual level, L90<40dBA
For intermittent daytime only or seasonal source operation	70	65
Extensive or 24/7 source operation	65	<b>60</b>

Table A5.2-1. Maximum allowable dBC levels for protecting residential areas against low frequency noise problems (no safety margin).

C-weighted sound levels were computed for the proposed project from the predicted octave band sound levels, at 106 nearby neighbor homes. ***They ranged from 60 to 65 dBC, with the vast majority 63 to 64 dBC.*** Essentially all nearby homes listed in the application will experience low frequency sound levels above limits determined necessary by experienced acoustic investigators to protect residential areas against low frequency noise problems.

***Finding: For essentially all nearby neighbors (over 100), the project is predicted to exceed by several or more decibels, the Hessler 60dBC criteria to protect residential areas against low frequency noise problems. The proposed project appears certain to breach Illinois law Chapter 35, 900.102 by adversely affecting enjoyment of life.***

9 N. Broner, A Simple Outdoor Criterion For Assessment Of Low Frequency Noise Emission, Acoustics Australia Vol. 39 April (2011) No. 7.

10 G.F. Hessler Jr., Private communication with Broner, 2008.

5.3 Project A-weighted sound levels exceed guidelines for complaints and health impacts.

A summary paper was developed by Hessler and Associates in 2011 assessing for guidelines for industrial wind turbine noise[11]. Hessler arrived at recommendation of a design goal upper limit of 40 dBA. The 40 dBA limit includes a determination of sleep disturbance above 40 dBA by WHO. While Hessler opines that 45 dBA may only affect some 4 percent of the population, ***there is no possible justification for an INCE member to design a facility that would subject neighbors to sleep deprivation or home abandonment.*** The table below summarizes limits from state and international sources.

Source	Effective Limits	Comments
WHO	40 dBA Night	Sleep Disturbance Threshold
Consensus of Int'l Limits Specifically on Wind Turbine Noise	45 dBA Day/40 dBA Night	Arithmetic Average of all Standards
U.S. EPA	45 dBA Day/35 dBA Night	DNL=45 dBA
State Standards	38 to 40 dBA Night	Based on the 3 States using an Ambient-Based Approach

Table A5.3-1. Hessler summary of Effective Limits for industrial wind turbines, dBA.

The project’s dBA noise level was determined at nearest neighbor residences by summing the predicted octave band sound levels with A-weighting applied. ***The dBA levels at nearby homes range from 43 to 47 dBA, well over the WHO 40 dBA threshold for sleep disturbance, and well over other nighttime limits outlined by Hessler.*** These predicted levels from the applicant apparently do not account for noise increases (up to several decibels) occurring when wind turbines inflow winds include strong turbulent air from upstream wind turbines within 7 diameters. Higher dBA noise levels than these are expected in this project where many if not most turbines will have turbulent air arriving from other turbines located upwind less than 7 diameters (many are at 3 to 4 diameters separation). EPA threshold of complaints for large industrial noise sources in rural areas was confirmed at 35 dBA through normalization analysis using the EPA 1974 Levels Document, Appendix D.

*It should be noted here that these predicted wind turbine noise levels are anything but benign. The predicted A-weighted noise level for the Hartke home at the California Ridge facility footprint was approximately 43 dBA; that equals the lowest predicted noise level for nearest homes evaluated in the application under review. The 43 dBA noise level at the California Ridge project resulted in home abandonment.*

***Finding: For all nearby neighbors, the project is predicted to exceed by several or more decibels, the WHO 40 dBA sleep disturbance threshold and other 35-40 dBA limits identified by Hessler to prevent nuisance. The proposed project appears certain to breach Illinois law Chapter 35, 900.102 by adversely affecting enjoyment of life.***

11 D.M. Hessler and G.F. Hessler, “Recommended noise level design goals and limits at residential receptors for wind turbine developments in the United States”, Noise Con. Eng. J., 59(1), 94-104, 2011.

Attachment 6. Table of properties with predicted sound levels exceeding Illinois noise limit.

Non-participating property ID	Lat	Long	Nearest turbines	Highest dBA found on property	Calculated exceedence for 1000 Hz, dB
2218200017	40.81121011	-88.57240428	T18	55	8
2316100004	40.80926963	-88.42114177	T13	55	8
2317100002	40.81036387	-88.43943483	T11,T12	55	8
2318100002	40.81012434	-88.4618141	T9	55	8
2419100003	40.79361492	-88.3517893	T59	55	8
2629200002	40.69516353	-88.43274375	T89	55	8
2629200005	40.69564178	-88.43395885	T107	55	8
2307100002	40.82300491	-88.4624326	T2,T3	54	7
2317200004	40.81036387	-88.43943483	T12	54	7
2333400006	40.76673975	-88.41723222	T125	54	7
2336400001	40.7659491	-88.35158666	T70	54	7
2417100001	40.80951325	-88.33134856	T77	54	7
2417300001	40.80399744	-88.34108878	T77	54	7
2428100004	40.79638885	-88.30162517	T52,T53,T54	54	7
2431200005	40.76846741	-88.34183208	T72,T73	54	7
2619100023	40.7091479	-88.45691145	T93	54	7
2630100002	40.69692652	-88.46057086	T97	54	7
2707300004	40.7365583	-88.34535445	T81	54	7
2707300005	40.7365583	-88.34535445	T81	54	7
2906100007	40.65493448	-88.45447529	T117	54	7
na	40.70712878	-88.4779376	T92	54	7
na	40.79670922	-88.34535861	T59	54	7
2215400007	40.80341047	-88.50495827	T14	53	6
2216100003	40.81052715	-88.53754134	T135,136	53	6
2223200008	40.79692491	-88.49638455	T16	53	6
2225300019	40.77886807	-88.47587567	T21	53	6
2307200002	40.82300491	-88.4624326	T3,T4	53	6
2316200004	40.80926963	-88.42114177	T13	53	6
2316400005	40.80926963	-88.42114177	T13	53	6
2319400009	40.79473625	-88.45472889	T23	53	6
2324200002	40.79483374	-88.36268526	T58	53	6
2324400003	40.79371853	-88.36216685	T58	53	6
2325100003	40.78499905	-88.36205765	T64	53	6
2326200001	40.78946965	-88.38451664	T36	53	6
2329100002	40.78164188	-88.44605385	T29	53	6
2601200009	40.76013598	-88.35608579	T75	53	6
2614100005	40.7254028	-88.38633303	T131	53	6

2621200003	40.70968962	-88.41171999	T104	53	6
2624100003	40.71388793	-88.36623239	T83	53	6
2627200004	40.69565257	-88.39544406	T88	53	6
2628400012	40.69580235	-88.41977455	T106	53	6
2629200005	40.69400119	-88.43763937	T107	53	6
2632100010	40.680585	-88.43972284	T108	53	6
2633100013	40.68008215	-88.41908105	T110	53	6
2906200003	40.66881791	-88.45003288	T96	53	6
2906200023	40.66881791	-88.45003288	T96	53	6
na	40.6799222	-88.42204865	T110	53	6
na	40.68031895	-88.47759013	T101	53	6
na	40.76557831	-88.42508991	T123	53	6
na	40.82551366	-88.31311303	T40	53	6
2318200001	40.80957351	-88.4504158	T10	52	5
2322300004	40.79159204	-88.39181479	T35	52	5
2322400002	40.79621725	-88.39867543	T33	52	5
2329200001	40.78061705	-88.44064509	T31	52	5
2330300002	40.77807181	-88.46230116	T26	52	5
2419400002	40.79361492	-88.3517893	T60	52	5
2524300005	40.70712878	-88.4779376	T92	52	5
2525400001	40.69342065	-88.47339775	T95	52	5
2526200002	40.69354991	-88.49989334	T94	52	5
2619400001	40.7091479	-88.45691145	T93	52	5
2620100017	40.70611285	-88.43904226	T103	52	5
2621100003	40.71169552	-88.42103952	T104	52	5
2623100003	40.71562775	-88.37942179	T84	52	5
2623100007	40.71875243	-88.38031384	T84	52	5
2628300006	40.69387803	-88.42364402	T106	52	5
2628300007	40.69089215	-88.43058514	T106	52	5
2630100007	40.69692652	-88.46057086	T97	52	5
2630400007	40.69115482	-88.43799865	T99	52	5
2906200025	40.6697089	-88.4516362	T96	52	5
na	40.63472722	-88.46894056	T122	52	5
na	40.63910428	-88.47098416	T122	52	5
na	40.69069832	-88.3930046	T86	52	5
na	40.81986712	-88.32988582	T44	52	5
2320400001	40.78978877	-88.42990907	T28	51	4
2329200004	40.78374294	-88.43850597	T31	51	4
2620200005	40.70872957	-88.43550925	T103	51	4
2629100012	40.69515125	-88.43851324	T107	51	4
2632300022	40.67901965	-88.44296828	T108	51	4
2632300023	40.67901965	-88.44296828	T108	51	4
2906200020	40.6697089	-88.4516362	T96	51	4

na	40.82303492	-88.4692444	T1	51	4
2223200005	40.79692491	-88.49638455	T16	50	3
2223200007	40.79687503	-88.49633586	T16	50	3
2329100001	40.78385554	-88.43979814	T31	50	3
2329300004	40.78164188	-88.44605385	T31	50	3
2335300001	40.76670175	-88.37891346	T129	50	3
2335300002	40.76670175	-88.37891346	T68	50	3
2335400003	40.76690749	-88.36723893	T68	50	3
2417200001	40.80951325	-88.33134856	T47	50	3
2611100001	40.74341691	-88.37948972	T130	50	3
2619100028	40.70877242	-88.46285009	T93	50	3
2619200004	40.7091479	-88.45691145	T93	50	3
2620400006	40.7057058	-88.43605212	T103	50	3
2621400001	40.71124423	-88.42043261	T104	50	3
2622400004	40.70909231	-88.39645016	T132	50	3
2627300004	40.69066712	-88.39822878	T86	50	3
2628300001	40.69087353	-88.43278441	T89	50	3
na	40.64306527	-88.46861649	T118	50	3
na	40.69354991	-88.49989334	T94	50	3
na	40.70836712	-88.47801007	T92	50	3
na	40.82551366	-88.31311303	T40,T41	50	3
2212400003	40.82136743	-88.47007191	T1	49	2
2225300016	40.77672005	-88.47924129	T21	49	2
2308100002	40.82399317	-88.43695414	T4,T5	49	2
2313400006	40.80423725	-88.34063007	T55	49	2
2319200007	40.79687758	-88.45390505	T23	49	2
2322300003	40.79159204	-88.39181479	T34	49	2
2324400002	40.79371853	-88.36216685	T58	49	2
2417300002	40.80399744	-88.34108878	T77	49	2
2418100002	40.81357719	-88.35179354	T55	49	2
2602300004	40.74539509	-88.37909416	T130	49	2
2612100003	40.75040382	-88.35531245	T78	49	2
2621300005	40.70110092	-88.42255118	T105	49	2
2626300009	40.69355491	-88.39654172	T88	49	2
2629300009	40.69115482	-88.43799865	T107	49	2
na	40.68212713	-88.49411686	T100	49	2
na	40.68217828	-88.49255789	T100	49	2
na	40.70898689	-88.47603713	T91,T92	49	2
na	40.82551366	-88.31311303	T41	49	2
2218100002	40.81121011	-88.57240428	T18	48	1
2218100003	40.81121011	-88.57240428	T18	48	1
2223200007	40.79760738	-88.49600318	T15,T16	48	1
2223401001	40.79692491	-88.49638455	T126	48	1

2319200024	40.79652211	-88.45234857	T23	48	1
2320400003	40.79608477	-88.42442314	T28	48	1
2322100009	40.79530809	-88.39767143	T33	48	1
2322300003	40.79530809	-88.39767143	T33	48	1
2322400003	40.79627171	-88.39472637	T33	48	1
2322400004	40.79159204	-88.39181479	T35	48	1
2323100002	40.79583005	-88.38331987	T34	48	1
2325200002	40.78916239	-88.34962564	T65	48	1
2328300010	40.78134509	-88.42691311	T28	48	1
2329200002	40.78374294	-88.43850597	T31	48	1
2417200002	40.80951325	-88.33134856	T49	48	1
2418100006	40.81384005	-88.33504431	T56	48	1
2418200002	40.81466807	-88.33564245	T56	48	1
2419100002	40.80423725	-88.34063007	T58,T59	48	1
2419300009	40.79361492	-88.3517893	T59,T60	48	1
2422100003	40.80987076	-88.30182864	T51	48	1
2525400003	40.68992009	-88.46096317	T97	48	1
2536100010	40.68358434	-88.48152715	T101	48	1
2536100012	40.68358434	-88.48152715	T101	48	1
2602300018	40.74540932	-88.37988949	T130	48	1
2614100001	40.7254028	-88.38633303	T131	48	1
2620400004	40.7057058	-88.43605212	T103	48	1
2621300005	40.70852277	-88.42016689	T104	48	1
2622100004	40.70909231	-88.39645016	T132	48	1
2629300010	40.69057393	-88.44207586	T99	48	1
2801300007	40.64781727	-88.46136592	T118	48	1
2801400001	40.65597369	-88.45288696	T116	48	1
2801400002	40.65256828	-88.45459714	T117	48	1
2906200009	40.6700021	-88.45037692	T96	48	1
2906200014	40.6700021	-88.45037692	T111	48	1
2906400003	40.65256828	-88.45459714	T117	48	1
na	40.69354991	-88.49989334	T94	48	1

Attachment 7. List of homes with predicted sound levels exceeding Hartke home predicted levels for California Ridge, **dba levels 43+ associated with HOME ABANDONMENT.**

	Application Supplement Predicted Octave Band Noise Levels										Calc dBA	Hartke Home Cal Ridge	Diff dB	Same or higher than Cal Ridge?
	Freq., Hz	31.5	63	125	250	500	1000	2000	4000	8000				
HOME	IPCB Night, dB:	<b>69</b>	<b>67</b>	<b>62</b>	<b>54</b>	<b>47</b>	<b>41</b>	<b>36</b>	<b>32</b>	<b>32</b>				
R-005	NP	64	60	54	47	44	41	31	5	-77	<b>46</b>	43	3	<b>YES</b>
R-006	NP	63	60	54	47	43	40	31	8	-61	<b>46</b>	43	3	<b>YES</b>
R-007	NP	63	59	53	46	42	39	28	-2	-96	<b>45</b>	43	2	<b>YES</b>
R-008	NP	63	60	54	47	43	40	30	4	-70	<b>46</b>	43	3	<b>YES</b>
R-009	NP	63	60	54	47	42	39	27	-6	-106	<b>45</b>	43	2	<b>YES</b>
R-010	NP	64	60	54	47	43	39	28	-4	-100	<b>45</b>	43	2	<b>YES</b>
R-012	NP	64	60	54	47	43	40	31	3	-80	<b>46</b>	43	3	<b>YES</b>
R-021	NP	63	60	54	47	43	40	30	5	-68	<b>46</b>	43	3	<b>YES</b>
R-038	NP	63	59	54	47	43	41	31	5	-74	<b>46</b>	43	3	<b>YES</b>
R-039	NP	63	59	53	47	43	40	31	6	-73	<b>45</b>	43	2	<b>YES</b>
R-041	NP	60	56	50	42	34	34	22	-12	-119	<b>40</b>	43	-3	<b>NO</b>
R-043	NP	61	57	51	44	41	38	30	8	-59	<b>43</b>	43	0	<b>YES</b>
R-063	NP	63	59	53	46	43	40	30	5	-68	<b>45</b>	43	2	<b>YES</b>
R-085	NP	63	59	53	46	42	40	30	5	-67	<b>45</b>	43	2	<b>YES</b>
R-092	NP	64	60	55	48	44	41	31	4	-73	<b>47</b>	43	4	<b>YES</b>
R-099	NP	63	59	53	46	42	39	29	2	-77	<b>45</b>	43	2	<b>YES</b>
R-100	NP	63	59	53	46	42	39	29	5	-67	<b>45</b>	43	2	<b>YES</b>
R-101	NP	63	60	54	47	43	40	30	3	-79	<b>46</b>	43	3	<b>YES</b>
R-102	NP	64	60	54	47	44	41	32	8	-64	<b>46</b>	43	3	<b>YES</b>
R-142	NP	63	60	53	46	42	39	29	3	-75	<b>45</b>	43	2	<b>YES</b>
R-160	NP	63	59	53	47	43	40	30	5	-67	<b>45</b>	43	2	<b>YES</b>
R-166	NP	63	59	54	47	43	41	31	5	-74	<b>46</b>	43	3	<b>YES</b>
R-168	NP	63	59	53	47	43	40	31	8	-62	<b>45</b>	43	2	<b>YES</b>
R-186	NP	64	60	54	47	43	40	30	1	-85	<b>46</b>	43	3	<b>YES</b>
R-187	NP	63	60	54	47	43	39	28	0	-81	<b>45</b>	43	2	<b>YES</b>
R-210	NP	63	59	53	46	43	40	29	2	-79	<b>45</b>	43	2	<b>YES</b>
R-216	NP	63	59	53	47	43	41	33	10	-59	<b>46</b>	43	3	<b>YES</b>
R-222	NP	63	59	54	47	43	40	31	6	-64	<b>46</b>	43	3	<b>YES</b>
R-236	NP	63	59	53	47	43	40	31	10	-52	<b>45</b>	43	2	<b>YES</b>
R-239	NP	64	60	54	47	44	41	31	5	-70	<b>46</b>	43	3	<b>YES</b>
R-241	NP	64	60	54	48	44	41	32	6	-68	<b>46</b>	43	3	<b>YES</b>
R-242	NP	64	60	54	47	43	41	30	2	-80	<b>46</b>	43	3	<b>YES</b>
R-243	NP	64	60	54	47	44	41	32	8	-63	<b>46</b>	43	3	<b>YES</b>
R-270	NP	63	60	54	47	44	41	31	5	-71	<b>46</b>	43	3	<b>YES</b>
R-311	NP	64	60	54	47	44	41	31	6	-70	<b>46</b>	43	3	<b>YES</b>
R-313	NP	64	60	55	48	44	41	32	7	-67	<b>47</b>	43	4	<b>YES</b>
R-317	NP	64	60	54	47	43	40	30	3	-76	<b>46</b>	43	3	<b>YES</b>

R-318	NP	63	60	54	47	43	39	28	1	-80	<b>45</b>	43	2	<b>YES</b>
R-319	NP	64	60	54	47	43	40	29	0	-87	<b>46</b>	43	3	<b>YES</b>
R-321	NP	63	59	54	47	43	41	32	9	-61	<b>46</b>	43	3	<b>YES</b>
R-326	NP	63	59	53	46	42	39	30	5	-71	<b>45</b>	43	2	<b>YES</b>
R-329	NP	64	61	55	47	43	41	34	13	-50	<b>46</b>	43	3	<b>YES</b>
R-345	NP	64	60	54	48	44	41	32	7	-64	<b>46</b>	43	3	<b>YES</b>
R-355	NP	63	59	53	46	42	39	30	3	-78	<b>45</b>	43	2	<b>YES</b>
R-369	NP	63	59	53	47	43	41	31	3	-77	<b>46</b>	43	3	<b>YES</b>
R-382	NP	63	59	53	46	43	40	31	8	-60	<b>45</b>	43	2	<b>YES</b>
R-387	NP	63	59	53	47	43	39	28	-3	-96	<b>45</b>	43	2	<b>YES</b>
R-388	NP	64	60	54	48	44	41	31	4	-75	<b>46</b>	43	3	<b>YES</b>
R-389	NP	64	60	54	47	44	41	31	6	-71	<b>46</b>	43	3	<b>YES</b>
R-394	NP	64	60	54	47	43	41	32	9	-57	<b>46</b>	43	3	<b>YES</b>
R-396	NP	65	61	55	48	44	41	32	7	-68	<b>47</b>	43	4	<b>YES</b>
R-398	NP	63	59	53	46	42	39	29	3	-73	<b>45</b>	43	2	<b>YES</b>
R-399	NP	63	60	54	47	43	40	31	5	-71	<b>46</b>	43	3	<b>YES</b>
R-400	NP	64	60	54	47	44	41	31	2	-84	<b>46</b>	43	3	<b>YES</b>
R-408	NP	63	59	53	46	43	40	31	7	-62	<b>45</b>	43	2	<b>YES</b>
R-409	NP	63	59	53	46	42	39	31	8	-61	<b>45</b>	43	2	<b>YES</b>
R-423	NP	63	59	53	46	43	41	32	10	-55	<b>46</b>	43	3	<b>YES</b>
R-438	NP	64	60	54	47	44	41	33	11	-51	<b>46</b>	43	3	<b>YES</b>
R-439	NP	64	60	54	48	44	41	32	9	-62	<b>46</b>	43	3	<b>YES</b>
R-443	NP	62	58	53	46	42	40	30	5	-74	<b>45</b>	43	2	<b>YES</b>
R-444	NP	62	59	53	46	42	40	31	7	-64	<b>45</b>	43	2	<b>YES</b>
R-453	NP	62	58	52	46	42	40	30	3	-79	<b>45</b>	43	2	<b>YES</b>
R-484	NP	63	59	53	46	43	40	31	5	-73	<b>45</b>	43	2	<b>YES</b>
R-498	NP	63	59	53	47	43	41	32	11	-51	<b>46</b>	43	3	<b>YES</b>
R-501	NP	64	60	55	48	44	41	32	7	-66	<b>47</b>	43	4	<b>YES</b>
R-502	NP	64	60	54	47	44	41	30	2	-82	<b>46</b>	43	3	<b>YES</b>
R-503	NP	64	60	54	48	44	41	31	4	-76	<b>46</b>	43	3	<b>YES</b>
R-582	NP	63	59	53	46	42	39	28	-2	-96	<b>45</b>	43	2	<b>YES</b>
R-588	NP	64	60	54	47	44	40	30	-1	-95	<b>46</b>	43	3	<b>YES</b>
R-597	NP	63	59	53	46	43	40	31	8	-64	<b>45</b>	43	2	<b>YES</b>
R-748	NP	63	60	54	47	44	41	32	7	-65	<b>46</b>	43	3	<b>YES</b>
SR-C6	NP	62	59	53	46	42	39	29	1	-86	<b>45</b>	43	2	<b>YES</b>
R-011	P	64	60	54	47	43	40	30	3	-79	<b>46</b>	43	3	<b>YES</b>
R-013	P	64	61	55	47	44	41	33	10	-59	<b>47</b>	43	4	<b>YES</b>
R-014	P	64	60	54	47	43	40	31	4	-80	<b>46</b>	43	3	<b>YES</b>
R-022	P	64	60	54	48	44	41	32	8	-62	<b>46</b>	43	3	<b>YES</b>
R-023	P	63	59	53	46	43	39	29	3	-72	<b>45</b>	43	2	<b>YES</b>
R-028	P	63	59	54	47	44	41	33	11	-51	<b>46</b>	43	3	<b>YES</b>
R-059	P	63	59	53	46	43	40	29	0	-88	<b>45</b>	43	2	<b>YES</b>
R-060	P	64	60	54	47	44	41	33	10	-57	<b>46</b>	43	3	<b>YES</b>



R-091	P	64	60	55	48	44	41	31	6	-66	<b>47</b>	43	4	<b>YES</b>
R-093	P	63	59	53	46	43	40	30	3	-80	<b>45</b>	43	2	<b>YES</b>
R-122	P	62	59	53	46	42	39	29	1	-86	<b>45</b>	43	2	<b>YES</b>
R-183	P	63	59	53	46	42	40	31	8	-58	<b>45</b>	43	2	<b>YES</b>
R-185	P	64	61	55	48	44	41	31	4	-77	<b>47</b>	43	4	<b>YES</b>
R-191	P	63	60	54	47	43	40	32	8	-62	<b>46</b>	43	3	<b>YES</b>
R-217	P	62	58	52	46	42	40	32	10	-53	<b>45</b>	43	2	<b>YES</b>
R-221	P	63	59	53	47	43	40	31	6	-65	<b>45</b>	43	2	<b>YES</b>
R-237	P	63	60	54	47	44	41	33	12	-50	<b>46</b>	43	3	<b>YES</b>
R-240	P	64	60	54	47	44	41	31	6	-64	<b>46</b>	43	3	<b>YES</b>
R-244	P	64	60	54	48	44	41	32	6	-72	<b>46</b>	43	3	<b>YES</b>
R-314	P	64	60	55	48	44	41	31	4	-78	<b>47</b>	43	4	<b>YES</b>
R-324	P	64	60	54	47	43	40	31	5	-70	<b>46</b>	43	3	<b>YES</b>
R-327	P	64	60	54	47	44	41	31	4	-78	<b>46</b>	43	3	<b>YES</b>
R-354	P	63	59	53	46	43	40	32	10	-53	<b>45</b>	43	2	<b>YES</b>
R-363	P	62	59	53	46	42	40	30	5	-70	<b>45</b>	43	2	<b>YES</b>
R-395	P	64	60	54	47	43	40	30	2	-81	<b>46</b>	43	3	<b>YES</b>
R-397	P	64	60	54	47	43	40	29	-2	-95	<b>46</b>	43	3	<b>YES</b>
R-401	P	64	60	54	47	44	41	31	4	-80	<b>46</b>	43	3	<b>YES</b>
R-417	P	62	58	52	46	43	40	32	11	-51	<b>45</b>	43	2	<b>YES</b>
R-475	P	63	59	53	47	43	40	30	5	-70	<b>45</b>	43	2	<b>YES</b>
R-500	P	63	60	54	47	43	40	29	0	-90	<b>46</b>	43	3	<b>YES</b>
R-515	P	64	60	54	47	43	41	33	9	-62	<b>46</b>	43	3	<b>YES</b>
R-632	P	64	60	55	48	44	41	33	8	-71	<b>47</b>	43	4	<b>YES</b>
R-754	P	64	60	54	47	44	41	32	7	-67	<b>46</b>	43	3	<b>YES</b>
R-773	P	61	57	51	44	41	38	30	8	-58	<b>43</b>	43	0	<b>YES</b>

Notes: “NP”, Non-Participating (72), “P”, Participating (34).