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BEFORE THE OHIO POWER SITING BOARD

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In the Matter of the Application)
of Black Fork Wind Energy, LLC for)
a Certificate to Install Numerous)
Electricity Generating Wind Turbines in)
Crawford and Richland Counties, Ohio)

PUCO

Case No. 10-2865-EL-BGN

TESTIMONY IN OPPOSITION

INTRODUCTION

Please allow the following words, information and testimony to invite the members of the Ohio Power Siting Board to internalize the strongly held opinion of a non- participating homeowner, living within the boundaries of the proposed Black Fork Wind Energy Project. With the creation of the OPSB all decision making rights for the siting of an industrial wind energy production facility are given to you. So in a very real way you are me. You represent me.

I have lived at my current residence since 1962 when my parents bought the property from Mary Stephon. I am personal friends with Mrs. Stephon's grandson who has possession of the original sheepskin title signed by President James Monroe on December 18th 1818. This makes me a representative of only the second family to own this property since the founding of America.¹

Let me state now that I am adamantly opposed to the siting of even a single industrial wind turbine within the proposed project boundary. To do so will create an intolerable negative impact. We are very simply too densely populated of an area to coexist with a single

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industrial wind turbine , let alone 91 industrial wind turbines. My impression from a recent visit to the newly constructed industrial wind facility in the Van Wert/Paulding is that industrial wind is a big mistake for Ohio. It has taken a formerly peaceful rural countryside and turned it into something more closely resembling an international airport, or a DMZ. I assert that my opinion of the negative effect is as valid as a potential buyer who may be deterred from purchasing homes in the project area, and certainly more valid than a study provided by the developer of the wind project who has bias because of potential for profit.

THE NEGATIVES OUTWEIGH THE POSITIVES

The list of negatives include...Noise and shadows night and day, health issues for people and livestock, other detriments to wildlife including bird and bat mortalities and fragmentation of various species, potential for harmful stray voltage, a loss of economic development for the area and the devaluation of residential property values within a twenty thousand acre rural residential area. The following sections will address most of these concerns with greater detail.

NOISE AND HEALTH EFFECTS

Included for review is a copy of the book “Wind Turbine Syndrome” A Report on a Natural Experiment. By Nina Pierpont, MD, PhD. Doctor Pierpont book details a unique set of physical ailments from people living near industrial wind turbines. From the executive summary we find the following.²

- 1) Wind turbines cause Wind Turbine Syndrome. We know this because people have

symptoms when they are close to turbines and the symptoms go away when they are away from turbines. The study families themselves figured out that they had to move away from turbines to be rid of their symptoms, and nine out of ten have moved. Some sold and some abandoned their homes.

2) People do not abandon their homes out of “annoyance.” Reported symptoms, such as sleep deprivation, dizziness, and nausea, cannot be dismissed as “annoyances.”

3) The symptom cluster is consistent from person to person, hence the term “syndrome.”

4) The symptoms are sleep disturbance and deprivation, tinnitus (ringing in ears), ear pressure, dizziness, vertigo (spinning dizziness), nausea, visual blurring, tachycardia (fast heart rate), irritability, problems with concentration and memory, and panic episodes associated with sensations of movement or quivering inside the body that arise while awake or asleep.

5) Children are affected as well as adults, especially older adults.

6) People with pre-existing migraine disorder, motion sensitivity, or damage to inner ear structures (such as hearing loss from industrial noise exposure) are more susceptible than other people to Wind Turbine Syndrome. These results are statistically significant.

7) Wind Turbine Syndrome symptoms are not statistically associated with pre-existing anxiety or other mental disorders.

8) The sample size of 10 families/38 people was large enough for statistical significance with regard to susceptibility or risk factors.

9) The susceptibility factors are clues to the pathophysiology of Wind Turbine Syndrome. The symptom complex resembles syndromes caused by vestibular (inner ear balance organ) dysfunction. The proposed mechanism is disturbance to balance and position by noise and/or vibration, especially low frequency components of the noise and vibration.

10) A extensive review of recent medical literature reveals how balance-related neural

signals affect a variety of brain areas and functions, including spatial awareness, spatial memory, spatial problem-solving, fear, anxiety, autonomic functions (like nausea and heart rate), and aversive learning. These known neural relationships provide a robust anatomic and physiologic framework for Wind Turbine Syndrome.

11) Medical and technical literature on the resonance of sound or vibration within body cavities (chest, skull, eyes, throat, ears) is reviewed, since study subjects experience these effects.

12) Published studies of documented low frequency noise exposure (both experimental and environmental) are reviewed. These demonstrate effects on people similar or identical to Wind Turbine Syndrome. Indeed, one study from Germany in 1996 may indeed be Wind Turbine Syndrome.

13) Recent mail-in survey studies of people who live near wind turbines in Sweden and the Netherlands are reviewed. These show that people are severely annoyed at noise from wind turbines at much lower A-weighted noise levels than for traffic, train, or aircraft noise.

14) published literature documenting the effects of environmental noise on cardiovascular health and children's learning are reviewed. For health reasons, the World Health Organization recommends lower thresholds for nighttime noise than are currently observed in most countries--especially when the noise has low-frequency components.

15) Wind turbine Syndrome gives a name and medical description to a set of symptoms severe enough to drive people from their homes and establishes medical risk factors for such symptoms. This study and other studies reviewed in the report indicate that safe setbacks will be at least 2km (1.24 miles) and even longer for larger turbines and in varied topography. Further research is needed to clarify physical causes and physiological mechanisms, explore other health effects of living near wind turbines, determine how many people are affected, and investigate effects in special populations including children. Government funding and moratoria are appropriate.

PROPERTY VALUES

More injurious than the dismissal of the above listed impacts is the complete neglect by Element Power to broach the topic of property value and the negative effect that will be realized upon non-participating residential homeowners and lease holders alike. Not only is the topic not raised in the application nor are there any criteria cited on the subject. I anticipate that the answer from Black Fork Wind to my discovery question on this matter will allude to the Department of Energy study from the Lawrence Berkley National Laboratory titled "The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis" (hereafter "Report") If not this specific study the applicant Black Fork will posit the view there is no evidence to indicate that negative effects upon property values exist. Please consider the critique of the report by Albert R. Wilson whereby he points out a "problem becomes critical when it is recognized that less than 10% of the sales transactions in the Report had any view of the turbines, and that only 2.1% had a view rated greater than minor. The study is dominated by transactions where no influence is reasonably likely." Mr. Wilson also points out that hedonic interpretation methods employ thousands of regression models that can easily be adjusted to produce a desired outcome. Mr. Wilson also maintains that meaningful standards of real estate appraisals do exist and are maintained by the International Association of Assessing Officers (IAAO).³

A second source for an objective appraisal of property values within wind turbine developments is Michael McCann owner of McCann Appraisals LLC of Chicago Illinois. From page 5 of the attached report and opinion point 4 we find the very troubling

conclusions as reads.⁴

Real estate sale data typically reveals a range of 25% to approximately 40% of value loss, with some instances of total loss as measured by abandonment and demolition of homes, some bought out by wind energy developers and others exhibiting nearly complete loss of marketability.

The document used for illustrative purposes and used by permission was prepared for Adams County, Illinois. I ask the board to consider the examples found at the end of the report showing negative impacts upon homeowners within wind energy projects ranging across several states.

Also please understand that based upon the property loss projections cited, the residents located within the Black Fork Wind Energy Project could easily realize an immediate loss of value approaching FORTY MILLION DOLLARS.

A conservative projection for the sake of clarity might multiply 1000 homes with an average value of \$100,000.00. By removing 40% of real estate value we arrive quickly at the \$40 million level of losses. From Element Powers own shadow flicker report we find a figure of 1411 non- participating residences. Additionally 117 participating landowners are listed from Section 5 pages 52 through 94, Receiver Sound Impacts of the Black Fork application. Participating land owner within the project will also realize the negative impacts of the project while they are compensated for hosting the wind turbines. This raises another point of great injustice for the residents within the project footprint.

That being, the creation of two classes of people within the project area.

1) Homeowners who are subject to the negative impacts of the wind energy project and ARE COMPENSATED.

2) Homeowners who are subject to the negative impacts of the wind energy project.

Within the footprint of the Black Fork Wind Energy Project we find a ratio of nearly one hundred to one non-participating versus participating homeowners.

Mr. McCann's also includes a possible remedy for this inequity, that being the introduction of a Property Value Guarantee agreement into the siting/ approval process. This agreement is found on pages 32 through page 40 of the attached McCann document. To summarize the intention of the Property Value Guarantee is simply a protection of homeowners within the project boundary from loss of value by establishing an average value of three comparably valued homes NOT located within a wind energy project and making the developer contractually liable for the difference. Protections are also built into the agreement to insure fairness to the developer "Black Fork Wind". Points a. through g. illustrate a portion of the contract as shown.

- a. Assume that no wind energy center or utility scale wind turbine(s) are located within two (2) miles of the Property;
- b. Utilize comparable sale data of property, developed as the Property was developed as of the Ordinance Date and located a minimum of two (2) miles distance away from the Wind Energy Center, or further so that in the opinion of the appraiser the selling price of that comparable property was not influenced by the presence of the Wind Energy Center or any other wind energy project;
- c. Utilize a minimum of three (3) comparable sale property, located approximately the same distance from major population centers (such as Quincy) so that in the

opinion of
the appraiser the selling price of the comparable property was not influenced by
its
closer or more distant proximity to new or existing population or employment
centers.
d. Establish the market value which is based upon the Property as developed on
the
Appraisal inspection date, with consideration of any normal or typical
maintenance,
repairs or additions made during the effective term of this agreement;
e. Prepare a written narrative appraisal or residential form report supplemented
as
needed with written descriptions, analysis or comments, and which conforms to
the
requirements of USPAP;
f. Prepare the appraisal in full compliance with any and all state standards and
state
regulations which pertain to the preparation of an appraisal of the Property
except those
standards and regulations which conflict with these instructions; and
g. The appraiser shall note the condition of the premises, both interior and
exterior, at
the time of the appraisal.

McCann Appraisal, LLC

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If Property Owner and Guarantor accept the appraised value, then such value
shall
constitute the ASKING PRICE, and the Property Owners shall offer the above-
described
Property for sale at no less or more than a 5% difference with that price. If either
the
Property Owner or the Guarantor does not accept the appraised value, the
nonaccepting
party may retain a second qualified professional Appraiser, of its choice, who
shall not be made aware of the first appraised value and who shall determine the
market value of the above-described Property on the basis of Paragraph 5(a)
through
(g) above. If both parties do not accept the original appraisal, they shall agree to
the
second qualified professional Appraiser and Guarantor shall pay the costs. In the
event
a second Appraisal is obtained pursuant to this paragraph and is within ten
percent
(10%) of the first Appraisal, the ASKING PRICE shall be the arithmetic average
of the
original appraised value and the second appraised value, unless the Guarantor

or the
Property Owner is unsatisfied with such Appraisal with specific reason(s) given in writing
for disagreement with the Appraised value. In such event, the first two appraisers shall
be instructed to agree on a third qualified professional Appraiser, at the sole expense of
the Guarantor or the Property Owner, whichever is unsatisfied, unless both parties are
unsatisfied in which case the expense shall be equally shared, and who shall not be
made aware of either the first or second appraised values, and who shall determine the
market value of the Property on the basis of Paragraph 4 (a) through (g) above. The
ASKING PRICE will then be the arithmetic average of the three appraised values if the
lowest value is no more than fifteen percent (15%) lower than the highest appraised
value. If the fifteen percent (15%) range is exceeded the third Appraisal shall conclusively determine the ASKING PRICE for the purpose of this Agreement.

Also please see the attached study Values in the Wind: Analysis of Wind Power Facilities by Martin D. Heintzelman and Carrie M. Tuttle July 16, 2011.⁵ The findings of the study also corroborate the losses in value as revealed by Mr. McCann. Page 37 of the report Table 9 summarizes their finding to indicate at .1 mile from a turbine a 45.82 loss of value, 40.02 at .25 miles and .5 miles a 35.22 loss of real estate value. In section 6 of the report the authors stress the need to count not only the costs to developers (which include easement payments and PILOT programs), but also the costs to property owners local to new wind facilities.

REFUSAL OF PROPERTY GUARANTEE AGREEMENT

Should the developer reject the addition of a property value guarantee into the

siting/approval/mitigation process as may be expected, this argues strongly that they acknowledge the negative impacts their development will cause. Without this agreement I urge the board to reject the Black Fork Wind Energy project. I have personally confronted three principal members of Element Power about this guarantee Scott Hawken at a township meeting, Attorney Michael Sentinerri at the December 16th public meeting and Dennis Rice, land acquisition specialist at the Shelby Earth Day event. Each of these individuals resisted this idea and took a position of no comment.

CONCLUSION

To clarify let me remind that I have no desire to sell or move from my home. I do believe that I should have the ability to do so without major losses due to wind turbines. Without this protection I charge that a REVERSE CONDEMNATION is enacted on my property and all residents within the project. I also call this project (if sited without the property guarantee) A REGULATORY TAKING OF PRIVATE PROPERTY WITHOUT COMPENSATION. The citizens of Ohio deserve and expect better than this. At the very least we should be able to leave the area, or Ohio behind and start over in a state where the peaceable enjoyment of private property is defended by our elected leaders and regulatory bodies. And to do so without leaving behind decades of work and assets at a loss due to an improperly sited energy facility.

I also contend that the wind energy facility as proposed fails to meet the combined requirements of functionality, responsible environmental stewardship and public health and safety for industrial alternative energy facility. At approximately 20 thousand acres, the immense size of the Site makes it impossible to incorporate reasonable and appropriate setback allowances from neighboring properties, town and state roads, and schools and churches.

A grave risk to public health and safety is eminent with the absence of appropriate local and state regulations for this new form of energy generation. Further study is necessary to more carefully investigate and adopt a comprehensive regulatory framework that takes into account health, safety and environmental risks that have been identified through experience with similar projects in other areas. Ohio must ensure that there is no regulatory gap that may be exploited in a way that gives precedence to profit, over health, safety, the environment and the legitimate property rights and interests of local residents.

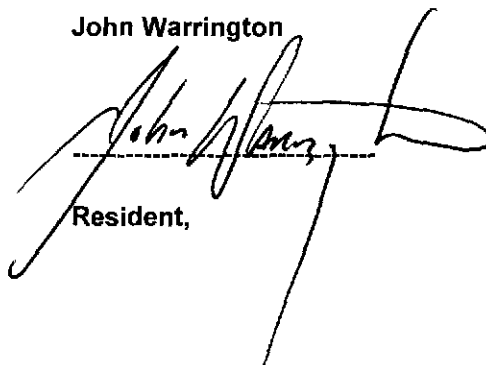
To avoid the devastating effects that have occurred elsewhere Ohio needs to enact expedited legislation for a MORATORIUM on wind power development and the creation of a framework to safely regulate this new industry.

Crawford and Richland Counties must not be made a sacrificial lamb or a testing ground for a developing technology that poses unacceptable risks and dangers when sited in a residential area. After due consideration of all relevant evidence, I submit that The Ohio Power Siting Board will recognize that the site chosen by Element Power LLC is a wholly inappropriate location for an industrial wind turbine facility in fundamental ways that can not be remedied.

Accordingly, I urge the Siting Board to deny the approval of the Black Fork Wind Energy Project and all other relief sought by Element power in Case No. 10-2865-EL-BGN

Respectfully submitted,

John Warrington

A handwritten signature in black ink, appearing to read "John Warrington", is written over a horizontal dashed line. The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Resident,

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Tiro, Ohio 44887

worldwarrington@hotmail.com

CERTIFICATE OF SERVICE

I certify that a copy of the forgoing document was served upon the following persons via U.S. Mail this 29th day of August 2011 :

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The Ohio Power Siting Board
Attn: Docketing Division Case No. 10-2865-EL-BGN
180 E. Broad Street, 6th Floor
Columbus, OH 43215

I certify that a copy of this document was served upon the following persons by hand delivery this day August 29th 2011.

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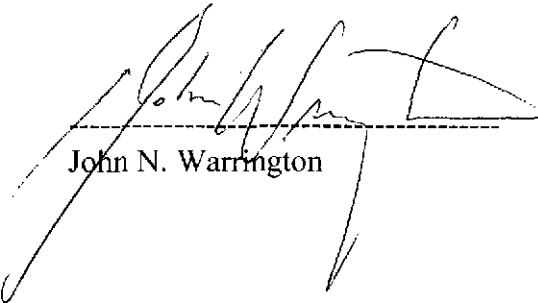
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John N. Warrington

MES. MONROE, President of the United States of America

TO ALL TO WHOM THESE PRESENTS SHALL COME, GREETING:

at the residence of Andrew Dickson of Indiana County, Pennsylvania
in the General Land Office a Certificate of the Register of the Land Office at Washington
that full payment has been made for the southwest quarter of Sec
in Township Twenty-one of Range Twenty

of Lands directed to be sold at Washington by the Act of Congress, entitled
"An Act for the sale of the Lands of the United States in the Territory north west of the Ohio, and above the
"Ohio River," and of the Acts amendatory of the same, and it is granted, by the United States, to the said
Andrew Dickson the quarter lot or portion of Land above described: To have and to hold
the lot or portion of Land, with the Appurtenances to the said Andrew Dickson
his heirs and assigns forever.

IN TESTIMONY WHEREOF, I have caused these Letters to be made Public and the Seal of the GENERAL LAND OFFICE to be hereunto affixed.

Witness my hand at the City of Washington, the 18th day of December in the year of our Lord one
thousand eight hundred and eighteen and of the Independence of the United States of America the 43rd.

By the President.

June 29 Page 170 Joseph H. Rogers. Commissioner of the General Land Office.

WIND FARMS, RESIDENTIAL PROPERTY VALUES, AND RUBBER RULERS©

by
Albert R. Wilson

I recently examined a document published by the Department of Energy's Lawrence Berkeley National Laboratory titled "The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis" (hereafter "Report"). I express no opinion concerning the impact of wind power projects on residential property values and instead focus on the underlying methods used in the development of the Report, and the resulting serious questions concerning the credibility of the results.

As stated in the title the primary bases for the conclusions drawn in the Report are hedonic analyses of residential real estate sales data. A hedonic analysis in turn is based on the assumption that the coefficients of certain explanatory variables in a regression represent accurately the marginal contribution of those variables to the sale price of a property.

Regression

A regression is a statistical process that attempts to quantify a hypothetical relationship between certain factors (explanatory variables) and the value of an outcome (dependent variable). The explanatory variables are related to the dependent variable through a mathematical formula generally referred to as a regression model. In real estate the explanatory variables are usually such things as size (square feet), number of bedrooms and bathrooms, garage space, presence of basement, location, and the like. The dependent variable is sales price. In the Report the authors are basing their analysis primarily on a set of regression models with the inclusion of variables that attempt to estimate the possible impact of distance from and view of turbines.

The mathematics of regression are executed through a computer program that assigns numeric values to the multipliers (coefficients) of the explanatory variables in such a way that when the estimates of the sales prices computed by the regression model are compared to the actual sales prices of the properties upon which the regression is based, the difference is at a mathematical minimum based on some measure (e.g. R^2 or R-squared, the coefficient of determination). This process is accomplished through the computer program by continually changing the coefficients of the explanatory variables, recalculating all of the estimated sales prices using the new coefficients, comparing the estimated to the actual sales prices and repeating the process until the minimum difference given the data and the regression model is achieved.

Using the hedonic analysts' favorite measure of R^2 , the usual hedonic interpretation is that if $R^2 = 1$ then the regression model explains all of the differences between the estimated and actual sales prices. If $R^2 = 0$ then none of the differences are explained and the regression model is a failure. If the underlying regression is not explanatory of the actual data then the dependent hedonic analysis cannot be explanatory.

There are literally thousands of possible real estate regression models. The literature in the hedonic field generally exhibits little agreement on a model's mathematical form or the explanatory variables that should be included.¹ Absent published and recognized standards on the validation of data, model development and testing, and calibration of the model against the real world market, a regression may be nothing more than a rubber ruler that can be stretched to provide a desired result.²

Standards

However, a well-developed and tested set of standards do exist. Those standards are published and maintained by the International Association of Assessing Officers (IAAO) and are explicitly for the accurate and reliable estimation of sales prices using regressions, not simply for appraisal purposes as some allege.³ These standards are employed many hundreds of times a day and are continually tested against the market.

For comparison purposes it should be noted that the usual hedonic regression model has an R^2 from 10% to more than 60% less than an acceptable regression under IAAO standards (IAAO R^2 better than 0.90⁴ versus the best R^2 cited in the Report of 0.78–13% less—for example). No satisfactory scientific explanation of why a regression with a smaller R^2 will provide more accurate and reliable hedonic results has been provided.

There is no evidence whatever that the Report employed any standards. While the authors refer to the literature as support for their method this is little comfort as there is no evidence that any recognized standards were applied to the work reported in that literature. Further, the literature contains a significant number of papers illustrating some of the problems associated with hedonic studies ranging from an absence of proper validation of the underlying data, to models deliberately manipulated to magnify the desired impact, to improper use of indicator variables, to a failure to check the results of the models against the market to determine if the proclaimed results actually represent market behavior.⁵

A common problem with the lack of adherence to standards is that the apparent magnitude and statistical significance of the coefficients of interest may be increased by simply not including important explanatory variables in the regression, generally known as the "omitted

¹ Atkinson, Scott E.; Thomas D. Crocker, "A Bayesian Approach to Assessing the Robustness of Hedonic Property Value Studies," *Journal of Applied Econometrics*, Vol. 2, 27-45 (1987).

² Wilson, Albert; "Real Property Damages and Rubber Rulers," *Real Estate Issues*, Summer, 2006

³ Standards on Valuation Models, IAAO.ORG

⁴ Gloudemans, Robert J., "Mass Appraisal of Real Property", International Association of Assessing Officers, 1999—One of the basic IAAO training manuals.

⁵ SEE FOR EXAMPLE Rogers, Warren, "Errors in Hedonic Modeling Regressions: Compound Indicator Variables and Omitted Variables," *The Appraisal Journal*, April, 2000

variable" problem.⁶ This omission may be the result of a lack of understanding of residential sales price behavior or from other considerations but the result is the same, skewed coefficient values. There is strong evidence of an omitted variable issue in the Report.

Another method of increasing the apparent importance of a coefficient is to aggregate data into increasingly more expansive variable definitions. This procedure was used in the Report and is acknowledged by its authors. "The Base Model described by equation (1) has variables that are pooled, and the coefficients for these variables therefore represent the average across all study areas (after accounting for area fixed effects). An alternative (and arguably superior) approach would be to estimate coefficients at the level of each study area, thereby allowing coefficient values to vary among study areas."⁷

The consequence of this aggregation is to distort the quantitative meaning of the coefficients. Possible situations in the Report include sales prices in areas of declining population and therefore decreasing demand—a majority of the areas examined—are not directly comparable to sales prices in areas of increasing population and therefore increasing demand, but these markets were combined in the Report. Also in the Report is the aggregation of markets such as those in Washington—used as the base for comparison to all other areas by the Report—where the urban market of Kennewick was aggregated with the rural market of Milton-Freewater 42 miles distant. The failure to recognize and account for the need for homogeneity of markets is a common failing of hedonics.

One of the major issues concerning the hedonic approach on a nationwide basis in ignoring local market homogeneity is addressed by the 2009 Coldwell Banker Home Price Comparison Index.⁸ It makes the point that local markets are critical. For example a house in Grayling, Michigan sells for \$122,675 while in La Jolla, California the same house sells for \$2,125,000. Creating an average sales price representing houses from nine states and at least 20 different markets—as the Report did—is a gross oversimplification that cannot provide for the specificity required to answer a micro-question such as an influence on sales price from a highly localized condition—distance to or view of a wind energy project.

This problem becomes critical when it is recognized that less than 10% of the sales transactions in the Report had any view of turbines, and that only 2.1% had a view rated greater than minor. The study is dominated by transactions where no influence is reasonably likely. The argument that the report is "data rich" may in fact be an overstatement of the situation because of this issue.

It is worth noting that IAAO standards discourage the use of regression for the analysis of

⁶ Rogers *ibid*.

⁷ Report page 134

⁸ "2009 Coldwell Banker Home Price Comparison Index," as cited in CNNMoney.com "Same 4-bedroom house - Wildly different prices", September 23, 2009.

the impact of a proximate condition on value precisely because of the small number of potentially influenced sales available for analysis by regression. Instead the use of the classic three approaches to value (sales comparison, income and cost) is encouraged as more reliable under these circumstances.⁹

A major issue pointed to in the literature is the influence of errors in the data. A recent article reported that, using an IAAO certified regression, as few as 15 erroneous sales skewed the estimated sales prices by at least \$500 for all but 43 of the 20,000 sales estimated.¹⁰ In another instance a single error in the age of a property out of some 18,000 data elements skewed the results of the regression from a finding of an influence on sales price to no influence on sales price. Absent access to the Report data these and similar issues cannot be evaluated. There is no evidence in the Report that any sales confirmation work that might have revealed these issues was undertaken.

Peer Review

The authors of the Report claim it has been peer reviewed and the method and results are supported by the peer reviewed literature. Unfortunately this claim means far less than it seems. Peer review in the context of this Report and the referenced literature consists of the reading of the report by several presumably knowledgeable individuals and the provision of comments to the authors based on that reading, nothing more.^{11, 12, 13} The authors may or may not have addressed all of the issues raised by the comments.

⁹ "Standard on the Valuation of Properties Affected by Environmental Contamination", IAAO.ORG

¹⁰ Cholvin, Brooke, Danielle Simpson, "Assessing Mortgage Fraud," Fair & Equitable, IAAO, August, 2009

¹¹ Chan, Effie J., "The 'Brave New World' of Daubert: True Peer Review, Editorial Peer Review and Scientific Validity," New York University Law Review, April, 1995, 70, N.Y.U.L. Rev 100. ALSO, Haack, Susan, "Peer Review and Publication: Lessons for Lawyers," Stetson Law Review, Vol. 36, 2007.

¹² "The Editor reads each submitted manuscript to decide if its topic and content of the paper fits the objectives of JRER. Manuscripts that are appropriate are assigned anonymously by the Editor to one member of the Editorial Board and at least one other reviewer. ... The referee presents a critique to the Editor who forwards it to the author. Each author should be encouraged to resubmit the manuscript for publication consideration. The Editor makes the final decision regarding re-submissions. ..." Editorial Policy and Submission Guidelines, Journal of Real Estate Research, American Real Estate Society, Volume 31, Number 2, 2009.

¹³ "The mistake, of course, is to have thought that peer review was any more than a crude means of discovering the acceptability—not the validity—of a new finding. Editors and scientists alike insist on the pivotal importance of peer review. We portray peer review to the public as a quasi-sacred process that helps to make science our most objective truth teller. But we all know that the system of peer review is biased, unjust, unaccountable, incomplete, easily fixed, often insulting, usually ignorant, occasionally foolish, and frequently wrong." "Genetically modified foods: "absurd" concern or welcome dialog?" Richard Horton, editor of Lancet, 1999; 354: 1314-1315

What is missing from this process is any semblance of testing for the scientific validity of the results, a testing rendered impossible by the refusal of the Report's authors to provide the underlying data. Absent the data it is not possible to independently validate the accuracy or reliability of the data, replicate the analyses, test alternative regression models (say models that meet IAAO standards), or calibrate the results against the real world market. Absent such scientific testing we have nothing more than opinion upon which to base an estimate of the credibility and applicability of the results.

At best a peer review—as that phrase is commonly used in this field—with respect to both the Report and the literature addresses only the acceptability of the paper for publication but does not in any meaningful way address the validity of the underlying work.

Hedonic Analysis

Hedonic analysis depends entirely on the accuracy and reliability of the underlying regression. If the regression does not conform to recognized standards then we have no independent assurance of that accuracy or reliability, as in this case.

Hedonic analysis also adds a new requirement, specifically that the coefficients of the explanatory variables of interest are quantitatively accurate and represent only the marginal contribution of that explanatory variable to the sales price. This is not a requirement of regression. In this case there is some doubt that the hedonic requirement has been met.

First, computer regression programs are mindless, they simply follow a set of instructions until they are fulfilled and then print the results. It is a simple matter to demonstrate that omitting or adding an explanatory variable will frequently influence both the magnitude and statistical significance of the other explanatory variable coefficients. It is also possible to include a totally meaningless explanatory variable and achieve statistical significance for its coefficient, making it appear meaningful. Absent the application of standards regressions may easily meet the needs of junk science.

Second the accuracy and validity of the coefficients of hedonic interest (in the Report the coefficients associated with View and Distance) must be separately tested to determine if they comply with the hedonic requirement of accurately and only representing the explanatory variables.

In the literature—as in the Report—the usual test employed is that of the statistical significance of the coefficient. Unfortunately all this test may tell us is that the coefficient

is statistically unlikely to be zero.^{14, 15} Knowing that a number is not likely equal to zero does not tell us anything about what it does represent or its importance to an analysis.

To determine if the coefficient has any hedonic value the test must be for the economic significance of the coefficient. Specifically a proof that the coefficient accurately and only represents the marginal contribution to sales price for that explanatory variable, and that it is of sufficient magnitude to provide a significant impact on sales price. There is no evidence of such testing in the Report, or indeed in the referenced supporting literature.

In Conclusion

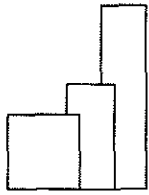
While I have other issues with the Report and again reiterate that I have no opinion on the influence of wind farms on residential sales prices, the concerns I have addressed here lead to the conclusion that the Report should not be given serious consideration for any policy purpose. The underlying analytical methods cannot be shown to be reliable or accurate.

The reasons for the conclusion may be summarized as:

- 1) Lack of access to the underlying data prevents the independent validation of the data, replication of the analysis, testing of alternative analyses, or testing of the conclusions against the real market.
- 2) The peer review process used for both the literature and the Report can only determine the acceptability of the papers for publication. It cannot reveal the validity, accuracy or reliability of the work behind the papers.
- 3) Given the peer review actually conducted the fact that no published and recognized standards for the development of an accurate and reliable regression on sales price were used render the Report of highly uncertain value for any purpose.
- 4) The exclusive use of a test of statistical significance only indicates that the coefficients for Distance and View variables are not conclusive. What we do not know is what those coefficients actually represent. Only tests of economic significance would provide an answer, and none has been conducted.
- 5) Low explanatory power, 13% less than an acceptable minimum for an accurate regression on sales price.

¹⁴ Although difficult to read the following covers both statistical and economic (scientific) significance in some detail, Ziliak, Stephen T., Deirdre N. McCloskey, "The Cult of Statistical Significance", The University of Michigan Press, Series: Economics, Cognition, and Society, Ann Arbor, MI and particularly the reference materials cited.

¹⁵ NOTE that the null and alternative hypotheses in a test of significance are required to be mutually exclusive and collectively exhaustive. The test of significance for a coefficient uses the null hypothesis of equality to zero but the alternative hypothesis is rarely stated. It appears that the hedonic analyst uses the idea that if the null can be rejected, then the coefficient must represent the marginal contribution of that variable to the sales price. The correct alternative hypothesis is that the coefficient is simply not equal to zero and nothing more can be said.



McCann Appraisal, LLC

June 8, 2010

Mike McLaughlin, Chairman
Adams County Board
Adams County Courthouse
507 Vermont St
Quincy, IL 62301

Re: Wind Turbine setbacks

Dear Chairman McLaughlin
and Members of the Adams County Board:

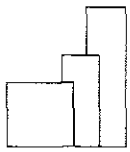
On behalf of my clients and as a real estate valuation advisor to the elected officials of Adams County, I am hereby submitting my written testimony as a professional real estate appraiser. Having been sworn in prior to expert testimony numerous times, I am quite familiar with the serious nature of giving my oath, and you may consider this written document to be a sworn affidavit. My opinions are also certified pursuant to Illinois Appraiser Licensing law and requirements.

I understand the County is considering a 1,000 foot residential setback requirement for wind turbines, and I have read that certain committee members are contemplating a recommendation increasing that to a 1,500 foot minimum. My testimony will address the adequacy of such setbacks, based upon a synopsis of widely known, reported and/or studied effects of living in close proximity to utility scale wind turbine projects. My testimony also includes results of my own independent study of property value impacts, and my professional opinions, recommendations and supporting illustrative comment are included along with supporting data I and other appraisers and researchers have developed as well.

Finally, I have projected the likely or probable impact to residential property values in Adams County, on the basis of what independent market research indicates. When considering an ordinance for setbacks from residential lots, as well as schools and other occupied dwellings or non-industrial land uses, I believe that my specialized expertise and experience as an appraiser familiar with wind farm issues is a relevant consideration for the policy-makers in Adams County.

Introduction

First and foremost, I understand very well that consideration of industrial scale wind energy projects is a unique situation for virtually every jurisdiction considering applications or requests from developers to build and operate such projects. They are intensive, large-scale projects with a decidedly industrial character, and most projects in



Illinois are proposed to “overlay” existing mixed-use residential and agricultural areas. This type of overlay is also sought in Adams County.

This is significant in the evaluation of land use compatibility or typical zoning standard compliance, since it is virtually impossible to introduce such a large scale project among existing low intensity residential uses without dramatically changing the character of the neighborhoods that will be encompassed by the turbine’s land use overlay.

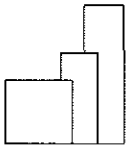
These large scale projects affect thousands of acres, and are far different than “typical” zoning variation or land use approval requests, such as a drive-through lane at a restaurant or bank, or a request to construct a gas station with a car wash. When the prudence of reviewing requests for smaller-scale, single uses is required to insure the new development does not adversely affect neighboring people or land uses, the immense scale and intensity of wind energy project development and operations demands even greater scrutiny and expert evaluation, which is often not financially feasible for smaller, rural counties.

My written testimony incorporates substantial experience with wind energy projects gained over the last 5 years, and 29 years experience as an appraiser. I have been qualified and testified in hundreds of contested and litigated land use matters, in zoning hearings, state and federal courts, and other public forums. I have been formally engaged to evaluate potential real estate impacts for 8 wind energy projects in Illinois, and have consulted with concerned citizens on a pro bono basis for several other projects throughout the United States. My qualifications and experience in this and numerous other impact studies, zoning compliance evaluations and property value damage claims is summarized within my professional biography included herein.

The **Appraisal Institute** has developed methodology and techniques for evaluating the effects of environmental contamination on the value of real property. The three potential effects that contamination can have on real property: cost effects, use effects, and risk (stigma) effects. All three effects are recognized as being present with utility-scale wind energy projects, as summarized in my written testimony.

Cost effects can include neighboring owner costs to attempt to mitigate against sound intrusion, shadow flicker, medical costs to deal with sleep deprivation related conditions, as well as, in some instances, the cost to rent substitute housing and potential legal costs incurred to protect individual owner’s property rights, etc. For Agricultural property, there can be increased costs due to the loss of ability to retain aerial spraying services, which can result in increased cost for ground spraying methods and/or decreased crop yields.

Use effects include the loss of peaceful use and enjoyment of their homesteads for many turbine neighbors, and there is evidence that livestock has been adversely impacted by the noise from turbines, ranging from death (*goats in Taiwan*) to reproductive disorders (*See Wirtz case in Wisconsin*) and behavioral changes and



irritability of horses and cattle. These may also represent cost effects, in some cases, or other forms of financial impact.

Stigma effects can range from loss of aesthetics, diminished views and character of neighborhoods, to fear of health issues and noise disturbance, etc. This effect is often manifest in the lack of marketability of homes in the “footprint” and nearby properties most impacted by active turbines, and to varying degrees the known and unknown cost and use effects are also contributing factors to stigma effects.

My opinions are also based on use of the recognized and generally accepted methods for valuing contaminated properties – paired sales analysis (*i.e. Appendix C*), environmental case studies analysis (*i.e. Appendices B, D, E and F*) and multiple-regression analysis (*i.e. Appendix D*). I have also reviewed studies conducted by other appraisers, which yield similar indications of property value impacts.

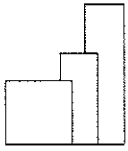
In the Adams County matter, my evaluation of the proposed wind turbine setbacks is conducted from a real estate valuation perspective with a land use impact focus, since every land use has some impact upon neighboring land uses and residents. The impact can be substantially positive, negative, or so minimal as to be immeasurable in terms of property values. As I understand it, governmental policies and land use decisions are intended to prevent “significant” negative impacts on property values and the peaceful use and enjoyment of existing property by area residents.

Further, I believe the majority of my written testimony, and supporting basis thereof, is applicable to other locations characterized by residential uses interspersed with historically compatible agricultural land uses.

In order to be perfectly clear, I must also state that I have developed no professional opinion or conclusions as to the validity of the need for, or effectiveness of, industrial-scale wind energy projects for their intended purpose: the creation of renewable energy. While my research has disclosed considerable controversy on these topics as well, I leave those conclusions, opinions and corporate or governmental decisions to experts on electric utility issues and those technical aspects of these projects.

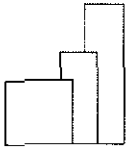
Thus, as a professional appraiser, I focus on the concept and reality of property value impacts. In order to understand the basis for any potential impacts, I have researched, collected, reviewed, studied and considered the same type of information available to anyone with an internet connected computer, which comprises the majority of the home-buying public in modern countries like the United States. I have also researched property values and value-related trends in larger wind energy project locations, to investigate whether industry claims are true or whether the neighboring citizens of such projects have valid claims regarding property value impacts.

Briefly stated, there is much to be concerned about as officials in Adams County whom are responsible for protecting the public health, safety and welfare, as well as the use and enjoyment of property and its underlying value.



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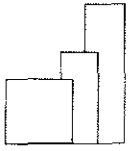
As the balance of my written testimony and the supporting documentation indicates, I have developed a summary of professional expert opinions and wind energy project impact mitigation recommendations, which includes nine (9) primary opinions and ten (10) recommendations, as follows:



SUMMARY OF OPINIONS & RECOMMENDATIONS

Opinions

1. Residential property values are adversely and measurably impacted by close proximity of industrial-scale wind energy turbine projects to the residential properties, with value losses measured up to 2-miles from the nearest turbine(s), in some instances.
2. Impacts are most pronounced within “footprint” of such projects, and many ground-zero homes have been completely unmarketable, thus depriving many homeowners of reasonable market-based liquidity or pre-existing home equity.
3. Noise and sleep disturbance issues are mostly affecting people within 2-miles of the nearest turbines and 1-mile distances are commonplace, with many variables and fluctuating range of results occurring on a household by household basis.
4. Real estate sale data typically reveals a range of 25% to approximately 40% of value loss, with some instances of total loss as measured by abandonment and demolition of homes, some bought out by wind energy developers and others exhibiting nearly complete loss of marketability.
5. Serious impact to the “use & enjoyment” of many homes is an on-going occurrence, and many people are on record as confirming they have rented other dwellings, either individual families or as a homeowner group-funded mitigation response for use on nights when noise levels are increased well above ambient background noise and render their existing homes untenable.
6. Reports often cited by industry in support of claims that there is no property value, noise or health impacts are often mischaracterized, misquoted and/or are unreliable. The two most recent reports touted by wind developers and completed in December 2009 contain executive summaries that are so thoroughly cross-contingent that they are better described as “disclaimers” of the studies rather than solid, scientifically supported conclusions. Both reports ignore or fail to study very relevant and observable issues and trends.
7. If Adams County approves a setback of 1,000 feet, 1,500 feet, or any distance less than 2-miles, these types of property use and property value impacts are likely to occur to the detriment of Adams County residences and citizens for which the nearest turbines are proposed to be located.
8. The approval of wind energy projects within close proximity to occupied homes is tantamount to an inverse condemnation, or regulatory taking of private property rights, as the noise and impacts are in some respects a physical invasion, an



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easement in gross over neighboring properties, and the direct impacts reduce property values and the rights of nearby neighbors.

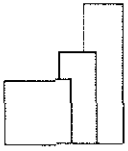
9. A market value reduction of **\$6.5 million** is projected for the residential property located in the footprint and within 2-miles of the pending Prairie Mills project located in east Adams County.



Recommendations

Therefore, if the County Board should choose to adopt the industry requested minimal setbacks, or some other setback of less than 2-miles from residential uses or occupied dwellings or structures such as schools, churches and nursing homes, I have developed a series of recommendations that would at least partially mitigate the widely experienced impacts prevalent with industrial scale wind turbines developments, as follows:

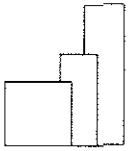
1. A Property Value Guarantee (PVG) should be required of the developer(s), significantly similar to the PVG attached hereto as **Appendix A**. A County-controlled fund or developer bond should be required to guarantee no undue delay in PVG payment(s) to legitimately affected homeowners, and/or to buy out homeowners located within 2-miles of any turbines if they elect to relocate away from the turbine project(s) and cannot sell for the pre-project market value of their properties. Such a guarantee is nominal in cost, relative to total project costs, and are used to condition high impact land use approvals such as landfills and even limestone quarries, as well as other wind energy developments (i.e. *DeKalb County, Illinois, etc.*)
2. An alternative to the bonding element of Recommendation # 1 would be to require that the developer(s) obtain a specialized insurance policy from a high-risk insurance carrier or legitimate insurer, such as Lloyds of London, if they will even insure against such impacts. If Lloyds was unwilling to provide such insurance, however, that should be compelling to the County that professional risk-management actuaries find such projects too risky for even them to insure. Under those possible circumstances the burden of risk is fairly placed with the developer, rather than the residential occupants who are being surrounded or otherwise directly impacted by close proximity of the projects.
3. If Adams County decides to permit projects, the limited evidence of impacts beyond a 2-mile setback would mitigate against the need for a PVG as cited in recommendation # 1.
4. If Adams County decides to permit projects, I recommend that the County require developer funding and a plan to constantly monitor not only sound levels in decibels, but also in low frequency noise emissions from the turbines utilizing the best available technology, or at least homeowner reports and logs. There is significant evidence and personal accounts confirming that low frequency sound/noise is "felt" by nearby occupants, and, as I understand it, cannot be measured by decibels as audible noise is typically measured. Disclosure of the owner's actual experience to prospective buyers is necessary from both an ethical perspective and, I believe potentially under the Illinois Real Property Disclosure Act, as a "known" defect or detrimental condition. Thus,



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documentation should be created at the cost of the developer(s), to insure that appropriate disclosures can be made to any prospective buyer(s) of homes within the 2-mile zone.

5. Appropriate devices should be installed at the developers expense at all occupied dwellings and property lines within a 2-mile distance of any turbines, and the County should retain the ability to immediately enforce the shut-down of any turbines exceeding a level of 10 decibels or more above ambient background noise levels from any property/home experiencing that exceeded noise level. The proximity of constant or frequent noise sources is an adverse impact to the use and enjoyment of a residential property, and indicates a basis for loss of property value.
6. An alternative to recommendation # 5 would be to place a limit on hours of operation, requiring turbines within 2 miles of any occupied (non-participating) dwelling be shut off during normal sleeping hours (*i.e. 10 p.m. to 7 a.m.*).
7. If the County finds that the wind energy projects are desirable from a economic development goal or perspective, or for the "public good", I recommend that "footprint" and 2-mile distant neighboring homeowners (measured to lot line from the furthest span of turbine blades) be afforded the opportunity to sell to either the developer or the County, with possible use of eminent domain powers employed by the County, on behalf of and at the expense of the developer(s).
8. The financial assurance for decommissioning and reclamation of wind turbine pad sites, *i.e.*, a bonding requirement, is also recommended as a County condition. To demonstrate solvency companies should pay the bond requirements before starting construction. It's basically insurance in case the company goes bankrupt or otherwise abandons the wind project without taking down the turbines and reclaiming the land. Coal mines, quarries, landfills and drilling companies have similar bond or financial assurance requirements.
9. An aesthetic landscaping requirement for wind project developers to plant mature trees or groves to shield the view between residential properties and turbines. Evergreens planted along property lines and/or other types of trees strategically planted between residential windows and turbines would partially alleviate aesthetic impacts from turbines.
10. The County should consider a moratorium on wind energy project development(s) in Adams County, until such time as:
 - A thorough and complete Wind Energy Ordinance is developed and adopted by the County, which incorporates all the protection and authority of zoning, building and health codes.

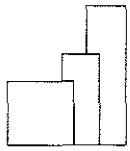


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- Appropriate Conditional or Special Use standards are developed and adopted, to insure wind developers carry the burden of their for-profit projects rather than the hosting jurisdiction(s) and/or neighboring property owners.
- The actual experiences of numerous existing turbine neighbors is documented thoroughly by an impartial group of professionals with appropriate qualifications in the various relevant fields of expertise, i.e., acoustic engineers, medical sciences, valuation professionals, etc.

The preceding recommendations are not intended to be all inclusive or to address all wind energy project issues and impacts. They are intended to address issues that affect the public health, safety and welfare of area residents, as well as their property values.

The following pages summarize portions of underlying support for the preceding opinions and recommendations.



General Impact Issues & Comment

Several issues are relevant considerations to property value impacts. As the real estate market becomes more aware of complaints and problems attendant to living near turbines, a stigma is becoming common. Stigma issues are inextricably intertwined with property value trends, and the general public has varying but increasing levels of awareness of underlying issues and conflicts with wind energy projects.

The most measurable impact on home values is the distances from the industrial-scale turbines. The categories of impact that my research discloses as most typically related to distance include:

- Noise and “vibro-acoustic” effect.
- Aesthetics & compatibility.

Wildlife impacts, i.e., bird & bat kills, road damage, tax & fiscal impacts are also issues attendant to wind farms, but have little or no identifiable correlation to property value impacts, and are only mentioned in passing.

The following comments, excerpts and attachments attempt to summarize a representative sample of these issues, industry claims, market reactions and responses by McCann Appraisal, LLC.

First, as a part time Florida resident and homeowner, I am quite concerned about the ultimate impacts of the ongoing and catastrophic oil spill in the Gulf of Mexico. I mention this man-made disaster because I note certain parallels between the goals, claims and realities between the Gulf situation and the wind energy development trend.

One might argue that man-made disasters like the Gulf oil spill are part of the justification for pushing full steam ahead on wind energy projects, yet the parallels remain between off-shore oil drilling and wind turbine projects:

- Both project types seek to provide independent energy needs for the United States.
- Both are extremely large scale types of projects, notwithstanding the invisible & noiseless infrastructure of oil rigs to most citizens, i.e., no neighbors at sea.
- Both industries have gone on record with claims that their projects are “safe”, will have very minimal impact on the environment, and include many “trust us” type statements, messages and public relations campaigns.
- Both have considerable evidence accumulated of “anecdotal”, but nevertheless serious negative impacts that are long-term and affect a relatively small percentage of the population.
- Both have historically had influence on political and legislative decision makers.
- Questionable “science” is cited and utilized by the energy industry to support their PR claims and approval requests, with respect to property values and health



issues emanating from noise, and primarily the sleep interruptions. As an example, Exxon was able to obtain a written opinion that the Valdez spill did not damage coastal property values, despite the nearly complete destruction of the local fishing-based economy and the extensive environmental degradation from the oil spill.

- With accidents like the Valdez spill and now the BP Gulf catastrophe, and against the growing anecdotal list of impacts from industrial-scale wind turbine projects, it is justifiable to enforce the assurances and responsibilities of the energy industry, overall, and to place the cost of mitigating their impacts on the corporations who develop, own and operate the energy projects.

Further, when the term ***“Green Energy”*** is used, I perceive an implicit claim by the wind energy industry and even governmental policy goals that creation of such energy is (*intended to be*) of low or no impact on the environment. I consider impacts on people and their property values to be included in the term “environment”.

There is however a considerable body of evidence that clearly shows there are in fact many circumstances where this intention does not match the reality, and is affecting many people, livestock, lifestyles, sleep and health issues, and the related underlying property values of wind turbine neighbors.

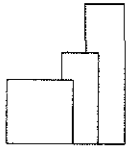
The Adams County consideration of a setback requirement is tantamount to a “zoning” ordinance, as it affects land use and compatibility with existing and neighboring land uses.

Zoning is defined in similar ways as:

- Dividing an area into zones or sections reserved for different purposes such as residence and business and manufacturing, etc.
- Legislative action for the purpose of regulating the use of property and the construction of buildings, facilities or structures within the area under the jurisdiction of the legislative body concerned.
- An exercise of police power by a municipality to regulate and control the character and use of property.
- Governmental authority over land use, intended to protect the public health, safety and welfare, while creating or preserving compatibility between land uses.

Most Zoning Ordinances require as a condition for approval of a special use, such as a wind energy generating project, that the ***“proposed use will not be injurious to the value of neighboring property”*** and/or ***“will not prevent the use and enjoyment of neighboring property for uses to which it is already used or zoned”***.

Despite the consistently reported effects on neighboring people, a typical developer's answer to this is: ***There is no “scientific” evidence of health issues.***



My response to that is there has been no legitimate study by the wind industry to determine what, if any health effects are linked to proximity to turbines.

To my knowledge there are no scientific studies that prove bricks falling from a high rise scaffold will cause injury or worse to people walking below, but there is enough "anecdotal" evidence over time to warrant building codes and ordinances that require effective barriers to **protect the public health, safety & welfare** (*which is exactly what zoning and other ordinances are supposed to accomplish*)

According to the website for Adams County, the Division of Health Protection's Environmental Health Section responsibilities include:

- reduction of food borne illnesses through restaurant and food stand inspection
- assurance of safe drinking water through private and non-community water well system permitting and inspection
- regulation of proper wastewater disposal through on-site wastewater system permitting and inspection
- permitting and annual inspection of tanning parlors
- investigation of nuisance complaints relating to the above-mentioned areas of responsibility as well as rodents and trash
- annual surveillance of mosquitoes and birds for the presence of West Nile Virus

From a land use policy perspective, which is directly related to the use and impact on homes from turbines, I anticipate the County may need to increase staff to deal with nuisance complaints from turbines located closer to homes than cited in recommendations #3, #4, #5 & #6.

To my knowledge, there are no scientific studies that prove there are *no* ill health effects either. The recent (December 2009) AWEA/CWEA report is merely a literature review that reads more like a "disclaimer", in its conclusions regarding review of other studies, and claims there is no scientific proof of adverse health effects. In fact, research has disclosed one of the Doctor/authors of that industry funded report has directly contradicted his prior sworn testimony regarding low frequency sound impacts so, to my mind, the report is wholly unreliable.

I may add that If citizens parked a vehicle in front of County Board member or developers homes with an audible or physically perceptible "thump-thump" low frequency beat emitted all night, with an occasional gear screeching or jet engine noise for good measure, there is little doubt that the local law enforcement department would be called with a disturbing the peace complaint. This complaint would also no doubt be enforceable, even if the vehicle was not actually parked on the complainant's property.



While the preceding remarks are perhaps as glib as industry claims that there are no adverse health, noise or property value effects, it is still an appropriate use of police powers of government bodies to **prevent** such disturbances.

But after the fact of a setback or other ordinance is approved, the noise generator has the authority of an ordinance approving the use to stand behind, and the local residents must either endure the disturbances, relocate or incur thousands of dollars in legal expenses just to be heard in a forum where the complaint is given new consideration, namely, in Court. This growing trend is costly for all involved, and can include the governmental body, participating land owners/lessors, as well as the developers and the innocent by-stander homeowners.

The alternative and, sadly, growing trend is for people to give up trying to deal with the problems of large turbines being developed in their midst, and abandon their homes (*See Wirtz family case in Wisconsin, etc*).

As a real estate appraiser with 25 years experience in evaluating zoning matters, I am unaware of any other land use in the 20 States in which I have worked that is permitted to cause such a nuisance that a property owner's rights are completely disregarded and protection of their property values marginalized to the point of meaningless and non-existent protection, via inadequate separation of incompatible uses based on industry-preferred setbacks.

I also suggest that when the governmental goal is economic development and tax revenue as the foundation for approval of these large-scale projects, they would be well advised to build in to their equation not only the cost of attorney fees to protect governmental decisions, but also the lost tax revenue from abandoned houses, potentially higher medical costs and injury claims from neighbors, road damage, and other ancillary costs that developers do not advertise, much less typically admit.

See the Canadian Hydro case for a group of neighboring homes bought out by the developer to eliminate certain vocal noise/health complaints, and note that those are not the first or last homes demolished as a direct impact of a wind energy project. Much can be read on the internet, and a summary of buy-outs is attached in **Appendix B**.

Adams County Background

Per Wikipedia, as of the census of 2000, there were **68,277 people** (66,234 residents projected for 2010), 26,860 households, and **17,996 families** residing in the county. The population density was **80 people per square mile** (31/km²). There were 29,386 housing units at an **average density of 34 per square mile**.

The median income for a household in the county was \$34,784, and the median income for a family was \$44,133 (Median Household Income projected for 2010 was \$42,880). The per capita income for the county was \$17,894. About 7.40% of families and 10.00% of the population were below the poverty line including 12.00% of those under age 18



and 8.90% of those aged 65 or over. 78% of county households earn less than \$75,000 per year, leaving limited relocation options available to the majority of people in the Adams County.

Median Home Value for 2000 was \$73,090 rising in 2005 to \$106,059 and by 2010 had reached \$132,445.

Property Value Impacts

Several physical factors, perceptions, stigma issues and concerns are reflected in the market trends used to measure property value impacts. The market trends include increased marketing time, decreased marketability and lower values for homes in relatively close proximity to new wind turbine projects. The negative factors typically include:

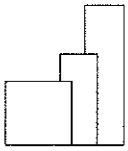
1. Audible sound and low frequency sound.
2. Health concerns and widely reported adverse affects at numerous project locations.
3. Sleep deprivation, which is sometimes also linked to health affects.
4. Aesthetic impacts due to introduction of large industrial-scale turbines into the immediate neighborhood, and which affects perceptions of compatibility and views from residential property.

The Appraiser has not attempted to isolate the level of value reduction related to each separate stigma issue, but has considered the sale price data to incorporate market awareness of these potential factors as a whole. Although the impacts vary from property to property, individual tolerances vary, and the distances between sale data and turbines also vary, adequate data exists to indicate that close proximity to turbines has a measureable and significant negative impact on residential property values.

I refer to **Appendix E** for a small sample of relevant sound and health concern research articles and reports, to assist the reader of this testimony in understanding the type of information still being developed regarding wind turbine noise. This sample is by no means complete or exhaustive as to the number of articles available to the general public on the internet, but it accurately reflects the trends and reported circumstances encountered by wind project neighbors.

Health concerns and impacts documented by Dr. Nina Piepont, the World Health Organization, and medical professionals from the United States, France, Canada, etc., link health impacts to noise issues primarily, and while not commonplace, there are reports of noise being heard or "felt" as far as 2-miles from the nearest turbine to residences.

Aesthetic impacts or amenity factors, while more subjective and personal, have a well established relationship to property values. An attempted objective measurement of



amenities represented by property sale data with vistas ranging from premium to poor is contained in **Appendix D, Figure ES-2**. This data was derived from the 2009 United States Department Of Energy (DOE) funded study, prepared by researchers affiliated with an acknowledged advocate of wind energy development, thus, it is not subject to being categorized as an "objector's study". Nevertheless, it is demonstrative that poor vistas (views) typically yield property sale prices **21% lower than homes with an average vista**, and approximately **34% lower than homes with a premium vista**.

Similarly, Figure **ES-4 in Appendix D** indicates measureable declines in property values over time, with reductions beginning after announcement of wind energy projects within a mile of home sales, and even steeper declines after the turbines have been operational for several years.

Finally, and despite the executive summary conclusions of the DOE funded study excerpted in **Appendix D, Figure ES-1** clearly shows a **5.3% to 5.5%** lower property value for homes within 1-mile of turbines, and a measured decline out to a 2 mile distance, as compared to the base-line home sales located more than 5-miles from turbines.

It is noted that this study analysis used regression analyses developed by the authors, and which has been subject to professional peer review criticism for the application of regression techniques and arguably incomplete or improper variables. Thus, this study may tend to minimize the actual impacts, as the carefully crafted language in the report's executive summary appears to indicate is the case.

What is clear is that there is a simple correlation or appropriate comparison between the data represented by Extreme Views of turbines and the Poor Vista views, as shown in the photograph appendices (D & E) within **Appendix D**, and the Poor Vista data shows a **21% lower than average value** for homes.

Appendix C contains data derived from Lee County Illinois Assessor records, and has in fact been used by an appraiser in Illinois for several different wind project developer zoning applications in Illinois and Wisconsin. After performing statistical analysis of select data with certain data excluded from the analysis, the appraiser was able to conclude that there was no measurable and statistically significant difference between home sales in zones within 2 miles and more than 2 miles from the nearest turbines of the Mendota Hills project.

However, there was also a 10% deviation from the mean, which indicates the conclusions are only valid beyond that deviation. In my opinion, discounting effects that lie within a 10% deviation is not indicative of appropriate consideration of value losses, as a 10% loss of home value is a significant loss to most people in the marketplace, and goes well beyond typical price reductions of negotiated sales. Regardless, both the near and far data is presumably reflective of typical negotiations, yet only the pattern from the nearby property sales shows even further declines in average sale prices.



I have analyzed the same data, as shown in **Appendix C**, on the basis most similar to how the market views residential property. On its face, the data reflects a **25% lower average** sale price per square foot for homes located within 2-miles of turbines, as compared to homes outside the 2 mile zone.

My findings are consistent with other non-industry retained appraisal studies of property values near wind turbine projects, and I submit copies of those studies as supplemental documentation to this written testimony.

Appendix F contains a partial list of wind turbine neighbor complaints which are mostly unresolved. However, when combined with the sample of developer buyouts caused by noise/health effects shown in Appendix B as well as other reports of home abandonment, rental of replacement housing by neighbors, and the non-anecdotal data contained in Appendices C and D, there exists adequate data to indicate market support for Recommendation 1 (Appendix A) to Adams County.

Property Value Impact Projection – Adams County

The pending Prairie Mills (PM) project located in east Adams County has been disclosed to the degree that a number of turbine leases are known to exist in certain sections of Claydon, Concord, Columbus and Camp Point Townships.

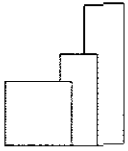
Via review of reported turbine lease location information and comparison with Farm Plat Maps for the preceding Townships, it has been estimated that approximately 143 homes are located within the “footprint” of the project, and Forty seven (47) Sections are identified as locations for at least one (1) turbine in each Section, which represents a 47 square mile or 30,000+ acre “footprint” for the PM project. This indicates an existing residential development density of just over 3 homes per square mile. Based on an additional 47 sections for each surrounding/abutting square mile, the 2 mile impact zone is estimated to contain approximately 94 square miles with 282 homes.

(94 square miles X 3 homes per square mile = 282 homes)

According to Adams County demographic data researched, the median home value was \$132,445 for 2010; say \$130,000. Thus, aggregate residential home values in the probable impact area for the PM project, prior to development of the project, is estimated as follows:

Footprint homes:	143 X \$130,000 = \$18,590,000
2-mile zone:	282 X \$130,000 = <u>\$36,660,000</u>
Aggregate value:	\$55,250,000

Further review and disclosure of locations may increase the number of homes within the 2-mile zone, as it may incorporate higher density communities. I also recognize that the most severe impacts are realized by homes in the footprint, and those with the shortest



setbacks from turbines outside the footprint. Those at the furthest points or with more effective screening afforded by topographic and landscaping features are not as likely to experience the maximum value impact. As a conservative check on the impact projections, I will utilize the 25% loss factor for homes in the footprint, and only a 5% value diminution factor as an average in the 2-mile zone. On this basis, property value losses projected due to the PM project are calculated as follows:

Footprint homes:	$\$18,590,000 \times 25\% = \$4,647,500$
2-mile zone:	$\$36,660,000 \times 5\% = \underline{\$1,830,000}$
Aggregate value reduction:	$\$6,477,500$ or \$6.5 million

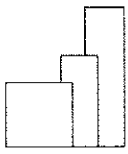
Thus, if each and every residential Property Owner within the footprint and the 2-mile zone elected to move and sold for the appraised value, and the developer in turn sold each home for the post-project reduced value, the developer would incur a cost or loss of about \$6.5 million. This is equal to the cost of 2 to 3 turbines, and is essentially a "contingency" category in their financial pro-forma, but clearly not a cost-prohibitive factor that warrants or requires abandonment of the project.

On balance, if the typical developer claims are true, then no homeowners will be disturbed to the degree that they will seek to move away from the project, and the value impact cost that is fairly absorbed by the project developer can be viewed as an unlikely worst-case scenario. However, if the market data supported basis for projecting value losses should materialize to the full extent of the projected estimate, then the developers gain should not be at the financial expense of existing homeowners and families.

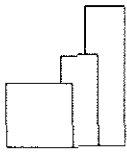
Further, at least one other wind energy project is proposed for Adams County, the Rock Creek project proposed for Ellington, Mendon South, Mendon North and Ursa Townships. Rumors of a third project have been discussed to some degree, but the Appraiser does not have adequate data to evaluate the level of impact probable in the latter two projects.

A somewhat meaningful projection of the impact of 2 or 3 projects, however, can be simply calculated by doubling or tripling the value losses projected for the Prairie Mills project, and refined at a later date on a pro-rata basis when the number of proposed turbines is known and the number of affected residential properties counted more accurately.

Further, based on the residential density of Adams County, overall, with an average density of 34 homes per square mile (also equal to 18.8 acres per home average), the number of homes in the footprint is estimated without projecting value losses into nearby towns or villages.



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Closing Comment

I trust that the preceding written testimony is useful to helping the Adams County Board in understanding better some of the issues that are commonplace with hosting wind energy project developments, and that complaints of neighbors are not just typical comment from people who don't want anything to ever change in their surroundings. There are real, tangible and discernible negative impacts and "stigma" associated with far too many wind projects to simply be an overly vocal minority.

When people react to the negative influences in ways that would normally seem extreme, such as filing lawsuits or selling their properties for steep discounts from what they should be worth on the open market, or give up on marketing attempts completely and end up abandoning homes, it is not a minor impact or "refrigerator noise" that triggers such market reactions. Those comparisons often made by wind energy representatives are disingenuous, based on virtually everything I have researched.

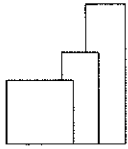
Market sale data analyzed not only by me, but also by proponents and highly paid consultants to the wind industry, can not hide the fact that these effects become measurably manifest in dollar terms, even if that is just one component of negative impacts.

To be sure, not every neighbor experiences the identical effects or has identical reactions, but the negative reactions are clearly widespread enough to warrant special measures, consideration and conditions to be placed on wind energy project developers, and use of setbacks that are well outside of industry preferences appears to be the single best way to avoid or minimize impacts.

I understand that my recommendation of a 2-mile setback exceeds most of the setbacks required by other communities, but then again it is not my goal to win favor with wind energy developers or to march in step with the typical community setback requirements. My setback recommendation also is fairly consistent with independent medical expert recommendations, which they have based on real-life experience in treating people suffering from closer proximity to turbines.

If it is Adams County's goal to avoid as much conflict as possible, the 2-mile setback, in my professional opinion, has the best chance of accomplishing this goal. However, if the County wants all the benefits promised by wind energy, developers will likely indicate that their projects are not feasible with that kind of requirement. I believe that my recommendations in the event of shorter setbacks are reasonable, economically justified and feasible, and will help to keep "whole" the residents who would be the real hosts to the turbines, by having them as neighbors day and night.

Wind developers are running against the clock to get the funding and tax benefits via expediting their projects as quickly as possible while it is still available, and it is reminiscent of the wild-west pioneering days of this country. Yet, we all know how that turned out for the natives of the land used for expanding the nation. It is my belief that



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orderly and controlled growth will be better in the long run for the economic health of host communities and their residents, and Adams County is in a position to guide this trend in such a manner by adopting reasonable low or no impact setbacks, and/or adopting the recommendations that will reduce social and financial impacts of utility scale wind energy projects proposed in Adams County.

My best wishes to the County in this difficult decision making process.

Respectfully submitted,

McCANN APPRAIISAL, LLC

Michael S. McCann, CRA
State Certified General Real Estate Appraiser
License No. 553.001252 (Expires 9/30/2009)



ADDENDUM

- Appraisal Testimony Certification
- Professional Biography of Appraiser
- Adams County Map
- Adams County Market Profile & Demographics
- Adams County Township Map
- **Appendix A -** Property Value Guarantee Agreement
- **Appendix B -** Canadian Hydro home buy out records
- **Appendix C -** Mendota Hills Property Value Impact Sale Data
- **Appendix D -** DOE funded Multiple Regression Analysis study of wind energy project impact on residential property values.
 - Figure ES-1
 - Figure ES-2
 - Figure ES-4
 - Appendix D - Vista rating photographs
 - Appendix E – View rating photographs
 - Cape Vincent Realtors Report on wind project impact on marketability of homes
- **Appendix E -** Case studies and articles regarding noise impact
- **Appendix F -** Representative sample of neighbor complaints



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EXHIBIT A

CONTINGENT AND LIMITING CONDITIONS OF APPRAISAL AGREEMENT

The following terms and conditions apply to this and any engagement of McCann appraisal, LLC (McCann), by the client. Written, electronic or oral authorization by the client or their attorney or agent to proceed with the assignment shall constitute acceptance of these terms by the client.

It is assumed that the title to this property is good and marketable. No title search has been made, nor have we attempted to determine ownership of the property. The value estimate is given without regard to any questions of title, boundaries, or encroachments. It is assumed that all assessments are paid. We assume the property to be free and clear of liens and encumbrances except as noted. No attempt has been made to render an opinion or determine the status of easements that may pre-exist.

The legal description, if included herein, should be verified by legal counsel before being relied upon or used in any conveyance or other document.

Any exhibits in the report are intended to assist the reader in visualizing the property and its surroundings. The drawings are not intended as surveys and no responsibility is assumed for their cartographic accuracy. Drawings are not intended to be exact in size, scale, or detail.

Areas and dimensions of the property have not been physically measured unless specifically stated by McCann in the written appraisal report. If data is furnished by the Client or from plot plans or surveys furnished by the Client, or from public records, we assume it to be reasonably accurate. In the absence of current surveys, land areas may be based upon representations made by the owner's agents or our client. No responsibility is assumed for discrepancies, which may become evident from a licensed survey of the property.

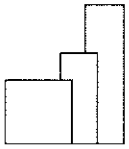
Our value estimate involves only the real estate and all normal building equipment, if any improvements are involved in this appraisal. No consideration was given to personal property (or special equipment), unless stated.

It is assumed that the property is subject to lawful, competent and informed ownership and management unless noted.

Information in this report concerning market data was obtained from buyers, sellers, brokers, and attorneys, trade publications or public records. This information is believed to be reliable. Dimensions, areas, or data obtained from others is believed correct; however, no guarantee is made in that the appraiser did not personally measure same.

Any information, in whatever form, furnished by others is believed to be reliable; however, no responsibility is assumed for its accuracy. The client specifically waives any claim of liability, which may result from reliance on information furnished by others.

The physical condition of any improvements described herein was based on visual inspection only. Electrical, heating, cooling, plumbing, sewer and/or septic system, mechanical equipment and water supply were not specifically tested but were assumed to be in good working order, and adequate, unless otherwise specified. No liability is assumed for the soundness of structural members, since no engineering tests were made of same. The roof(s) of structures described herein are assumed to be in good repair unless otherwise noted.



If the client has any concern regarding the structural, mechanical or protective components of the improvements described herein, or the adequacy or quality of sewer, water or other utilities, it is suggested that independent contractors or experts in these disciplines be retained and consulted before relying upon this appraisal, or a specific written disclosure of the defect or property condition must be made to the appraiser as part of the assignment.

We have not been provided, nor are we familiar with any engineering studies made to determine the bearing capacity of the land. It is therefore assumed that soil and subsoil conditions are stable unless specifically outlined in this report. We assume no responsibility for any such conditions, which may render the property more or less valuable. The client assumes responsibility for obtaining any engineering study necessary to determine soil and subsoil conditions. The client agrees to provide same in advance of execution of this agreement, or to waive any and all liability, which may result from undisclosed soil or subsoil conditions.

The existence of potentially hazardous material used in the construction or maintenance of the building, such as urea formaldehyde insulation and/or asbestos insulation, which may or may not be present on the property, has not been considered. In addition, no deposit of toxic wastes, unless specifically disclosed to the appraiser in advance of submittal of the appraisal report, has been considered. The appraiser is not qualified to detect such substances and suggests the client seek an expert opinion, if desired. Further, this report does not consider the potential ramifications due to the presence of Underground Storage Tanks (UST) or the possible environmental impact due to the leakage and/or soil contamination, if present.

It is specifically noted that the appraiser(s) have not conducted tests to determine the presence of, or absence of, Radon. We are not qualified to detect the presence of Radon gas, which requires special tests and therefore must suggest that if the client is concerned as to the presence of Radon or any other potentially hazardous substances, he or she should take steps to have proper testing done by qualified firms who have the equipment and expertise to determine the presence of this substance in the property.

The separate allocation between land and improvements, if applicable, represents our judgment only under the existing utilization of the property. A re-evaluation should be made if the improvements are removed or substantially altered, and the land utilized for another purpose.

All information and comments concerning the location, neighborhood, trends, construction quality and costs, loss in value from whatever cause, condition, rents, or any other data for the property appraised herein, represents the estimates and opinions of the appraiser formed after an examination and study of the property.

Any valuation analysis of the income stream had been predicated upon financing conditions as specified in the appraisal report, which we have reason to believe are currently available for this property. Financing terms and conditions other than those indicated may alter the final value conclusions.

Expenses shown in the Income Capitalization Approach, if used, are estimates only, and are based on past operating history if available, and are stabilized as generally typical over a reasonable time period.



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The appraiser is not required to give testimony or appear in court because of having made this appraisal, with reference to the property in question, unless arrangements have been made previously thereto. If the appraiser(s) is subpoenaed pursuant to court order, the Client will be required to compensate said appraiser(s) for their time at their regular hourly rates plus expenses.

All opinions, as to values stated, are presented as the appraiser's considered opinion based on the information set forth in the report. We assume no responsibility for changes in market conditions or for the inability of the Client or any other party to achieve their desired results based upon the appraised value. Further, some of the assumptions made can be subject to variation depending upon evolving events. We realize some assumptions may never occur and unanticipated events or circumstances may occur. Therefore, actual results achieved during the projection period may vary from those in our report.

Appraisals made subject to satisfactory completion of construction, repairs, alterations, remodeling or rehabilitation, are contingent upon completion of such work in a timely manner using good quality materials and workmanship and in substantial conformity to plans or descriptions or attachments made hereto.

The Americans with Disability Act (ADA) of 1990, (effective January 2, 1992), as passed by the United States Congress, establishes a clear and comprehensive prohibition of discrimination on the basis of disability. This public law (Titles I-V) addresses employment (I); public services (II); public accommodations and services operated by private entities (III); telecommunications (IV); and miscellaneous provisions (V). The law covers all "commercial facilities" intended for non-residential use whose operations affect commerce. Most private manufacturing, industrial, and warehouse facilities, are neither considered public accommodations (even though their office area may be), nor are they generally subject to Title III of the law.

The appraiser has not made a specific compliance survey and analysis of the subject property to determine whether or not it is in conformity with the various detailed requirements of the ADA. It is possible that a compliance survey of the subject property, along with a detailed analysis of the requirements of the ADA, could uncover that the subject property is not in compliance with one or more of the requirements of the Act. If this situation occurs, it could have an adverse effect upon the market value of the subject property.

Unless otherwise noted, it is assumed that the construction and use of the appraised property, if improved, complies with all public authorities having jurisdiction, including but not limited to the National Environmental Protection Act and any other applicable federal, state, municipal, and local environment impact or energy laws or regulations.

The appraisal services and appraisal report are intended and believed to be developed in compliance with the relevant requirements of the Uniform Standards of Professional Appraisal Practice (USPAP). A signatory of the appraisal report is licensed by the State of Illinois as a Certified General Real Estate Appraiser and is a Member or Associate Member of the Appraisal Institute. The Bylaws and Regulations of the Appraisal Institute require their members, candidates, or employers to control the use and distribution of each appraisal report signed by such member or candidate. Therefore, except as hereinafter provided, the party for whom the appraisal report was prepared may distribute copies of the appraisal report, in its entirety, to such third parties as may be selected by the party for whom the appraisal is prepared. Selected portions of this appraisal report, however, shall not be given to third parties without prior written



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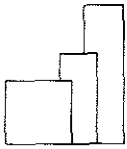
consent of the signatories of this appraisal report. Further, neither all nor any part of this appraisal report shall be disseminated to the general public by the use of advertising media, public relations media, news media, sales media or other media for public communication without the prior written consent of the signatories of the appraisal report. This restriction applies particularly as to the valuation conclusions, the identity of the appraisers, or any reference to the Appraisal Institute. McCann will retain the control and confidentiality of the clients file unless legally required to release such file.

The Appraiser/ consultant responsibility is limited to the client, and use of this appraisal by third parties shall be solely at the risk of the client and/or third parties. This report should not be used or relied upon by any other party except the client to whom the report is addressed. Any party, who uses or relies upon any information in the report without the appraiser's written consent, does so at his own risk.

It is the intent of the appraiser(s) and those that retain their services, that the liability of McCann for any allegation of negligent acts, omissions, misrepresentations, or erroneous reliance upon information provided by others, is limited to and shall not exceed the cost of the services rendered. In the event of any disagreement between the parties regarding the services performed, fees and/or expenses to be paid, or any other clause in this document, it is agreed that such dispute shall be submitted to arbitration. The client waives any cause of action in the event of their failure to file such claim within one year.

McCann retains all copyrights to any work product developed by McCann on this assignment, and licenses use of the report exclusively to the client in exchange for the professional fees disclosed in the proposal.

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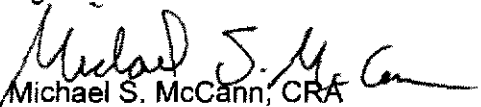
CERTIFICATION

PROPERTY LOCATION: Adams County, Illinois
Wind Turbine Setback written testimony

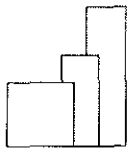
The undersigned, representing McCANN APPRAISAL, LLC, do hereby certify to the best of our knowledge and belief that:

- FIRST: The statements of fact contained in this written consulting testimony report are true and correct.
- SECOND: The reported analyses, opinions and conclusions are limited only by the reported assumptions and limiting conditions and represents the personal, impartial and unbiased professional analyses, opinions, and conclusions of the undersigned.
- THIRD: We have no present or prospective interest in the property that is the subject of this report and no personal interest with respect to any of the parties involved.
- FOURTH: We have no bias with respect to the property that is the subject of this report or to the parties involved with this assignment.
- FIFTH: Our engagement in this assignment was not contingent upon developing or reporting predetermined results.
- SIXTH: Our compensation for completing this assignment is not contingent upon the development or reporting of a predetermined value or direction in value that favors the cause of the client, the amount of the value opinion, the attainment of a stipulated result, or the occurrence of a subsequent event directly related to the intended use of this appraisal.
- SEVENTH: Our analysis, opinions, and conclusions were developed, and this report has been prepared in conformity with the Uniform Standards of Professional Appraisal Practice.
- EIGHTH: No inspection was made by McCann Appraisal, LLC of the property that is the subject of this report.
- NINTH: No one other than the undersigned provided significant real property appraisal assistance to the person signing this certification.
- TENTH: Neither the undersigned nor McCann Appraisal, LLC has previously appraised the subject property.

IN WITNESS WHEREOF, THE UNDERSIGNED has caused these statements to be signed and attested to.


Michael S. McCann, CRA

State Certified General Real Estate Appraiser
Illinois License No.553.001252
(Expires 9/30/2011)



McCann Appraisal, LLC

PROFESSIONAL BIOGRAPHY

MICHAEL S. MCCANN, CRA

Michael S. McCann has been exclusively engaged in the real estate appraisal profession since 1980, and is the owner of McCann Appraisal, LLC.

EXPERIENCE

His appraisal experience has included market value appraisals in 20 states of virtually all types of commercial, office, residential, retail, industrial and vacant property, along with a wide variety of unique or special purpose real estate, such as limestone quarries, hotels, contaminated properties, etc. Appraisals have been prepared for purposes including condemnation, litigation, purchase, sale, estate planning, fractional interest valuation, leasehold and leased fee analysis, financing, divorce, damages and construction defects, easements, highway extension and widening, foreclosure, and numerous other purposes.

He has gained extensive experience in real estate zoning evaluations and property value impact studies, including analysis of gas-fired electric generating plants, shopping centers, industrial facilities, limestone quarries, sanitary landfills, transfer station, cell tower and wind farm projects. He has been retained as an independent consultant to municipalities, government agencies, corporations, attorneys, developers lending institutions and individual and private owners associations, and has completed appraisals for the States Attorney of Cook County, Illinois, for numerous downtown office buildings, major retail, hotel and commercial properties.

In addition to evaluation of eminent domain real estate acquisitions for both property owners & governmental condemning authorities, Mr. McCann has served as a Condemnation Commissioner (2000-2002) appointed by the United States District Court - Northern District, for the purpose of determining just compensation to property owners, under a federal condemnation matter for a natural gas pipeline project in Will County, Illinois.

He has been a speaker at seminars for the Appraisal Institute, the Illinois State Bar Association and Lorman Education Services on topics including the vacation of public right of ways (1986), and Property Taxation in the New Millennium (2000), Zoning and Land Use in Illinois (2005, 2006).

Related real estate expertise has been gained through negotiating transactions with a total in excess of \$65 million for purchase and sales of acreage and smaller sites, commercial and residential properties, both as agent on behalf of private and governmental clients and personally.

EXPERT TESTIMONY

Deposition, trial and public hearing testimony has been given for assignments that include appraisals, studies and consultation regarding real estate located throughout the United States. He has qualified and testified as an expert witness in Federal Court and numerous State Circuit Courts for condemnation, property tax appeal, foreclosure, divorce, and property damage proceedings and zoning matters in the Counties of Cook, Will, DuPage, Boone, Lake, Madison, St. Clair, Iroquois, Fulton, McHenry, Ogle, Marshall, & Kendall, as well as the Chicago and Cook County Zoning Boards of Appeal, the Property Tax Appeal Board (PTAB) and tax court &



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Commissions of Illinois, Wisconsin, and Ohio, Circuit Courts in New Jersey and Indiana, as well as zoning, planning, and land use and County Boards in Texas, Missouri, Idaho, Michigan, New Mexico and various metropolitan Chicago area locales. He has been certified as an expert on the Uniform Standards of Professional Appraisal Practice (USPAP) by the Cook County, Illinois Circuit Court.

PROJECT EXPERIENCE

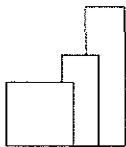
Mr. McCann has substantial experience in large-scale condemnation and acquisition projects and project coordination at the request of various governmental agencies and departments. These include appraisals for land acquisition projects such as the Chicago White Sox Stadium project, the Southwest Transit (Orange Line) CTA rail extension to Chicago's Midway Airport, the United Center Stadium for the Chicago Bulls and Blackhawks, the minor league baseball league, Silver Cross Field stadium in Joliet, Illinois, I-355 tollway and numerous highway acquisition and improvement projects, railway ROW transactions, as well as many other urban renewal, acquisition and neighborhood revitalization projects.

REAL ESTATE EDUCATION

Specialized appraisal education includes successful completion of Real Estate Appraisal Principles, Appraisal Procedures, Residential Valuation, Capitalization Theory and Techniques Part A, Uniform Standards of Professional Appraisal Practice and USPAP update courses, Case Studies in Real Estate Valuation, Highest and Best Use and Market Analysis, Advanced Income Capitalization, Subdivision Analysis and Special Purpose Properties, Eminent Domain and Condemnation, and Valuation of Detrimental Conditions in Real Estate offered by the Appraisal Institute. In addition, he has completed the Society of Real Estate Appraisers' Marketability and Market Analysis course, the Executive Enterprises - Environmental Regulation course, and a variety of continuing education real estate classes and seminars offered by other appraisal education providers, such as Litigation Valuation, Appraising in a Changing Economy, etc. Real estate courses from state licensed appraisal education providers were all subsequent to two years of associate study at the College of DuPage for marketing and real estate, and exceed the requirements for the Illinois Certified General Real Estate Appraiser license. Michael McCann is current with all continuing education requirements.

DESIGNATIONS, PROFESSIONAL AFFILIATIONS & LICENSES

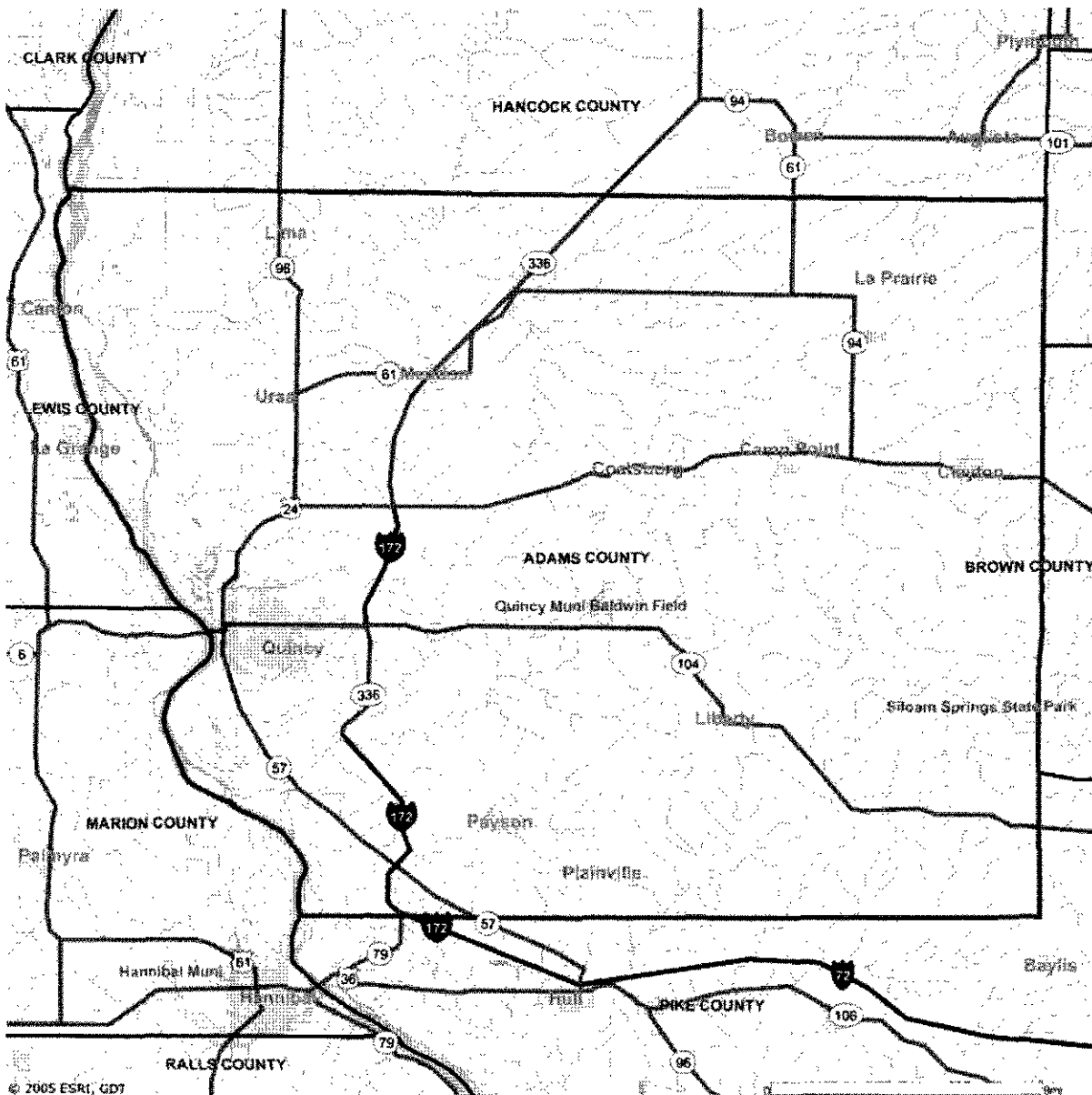
Mr. McCann is a State Certified Associate Member of the Appraisal Institute, and the National Association of Review Appraisers & Mortgage Underwriters designated him as a Certified Review Appraiser (CRA). He was elected in 2003 as a member of Lambda Alpha International, an honorary land economics society, and he served several years as a member of the Appraiser's Council of the Chicago Board of Realtors. He has held appraisal and sales licenses in several states, and is a State Certified General Real Estate Appraiser in the State of Illinois. *(License No. 533.001252, expiration September 30, 2011)*

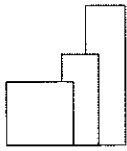


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Adams County Standard Map

January 10, 2006





Adams County Market Profile

2010 Housing Units	29,633
Owner Occupied Housing Units	68.9%
Renter Occupied Housing Units	20.1%
Vacant Housing Units	11.0%

2000 Total Population	68,277
2005 Total Population	67,488
2010 Total Population	66,234

Median Household Income

2000 \$34,800

2005 \$38,723

2010 \$42,880

Median Home Value

2000 \$73,090

2005 \$106,059

2010 \$132,445

Per Capita Income

2000 \$17,894

2005 \$20,584

2010 \$23,864

Median Age

2000 38.2

2005 39.4

2010 40.5

2010 Households by Income

Household Income Base

< \$15,000 13.8%

\$15,000 - \$24,999 13.0%

\$25,000 - \$34,999 13.7%

\$35,000 - \$49,999 16.9%

\$50,000 - \$74,999 20.7%

\$75,000 - \$99,999 9.3%

\$100,000 - \$149,999 1.8%

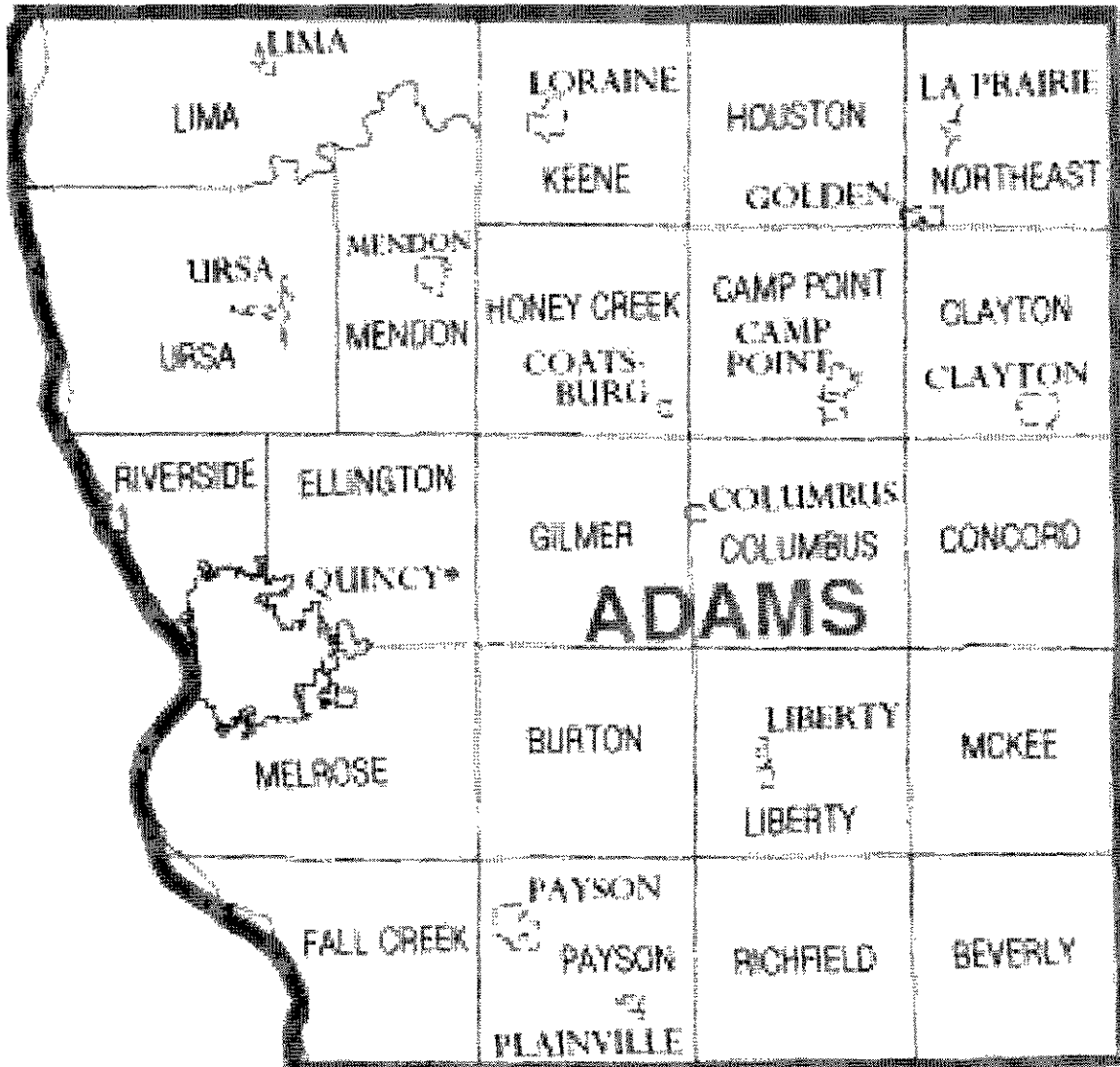
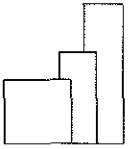
\$150,000 - \$199,999 2.2%

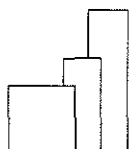
\$200,000+ 2.5%

Average Household Income \$58,213

Source:

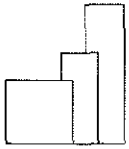
U.S. Bureau of the Census, 2000 Census of Population and Housing. ESRI forecasts for 2005 and 2010.





McCann Appraisal, LLC

Appendix A



McCann Appraisal, LLC

Property Value Guarantee Agreement

This Property Value Guarantee Agreement (Agreement") made and entered into on this ____ day of _____, by and between *(Insert Developer Corp. Name)* _____, having its principal offices at _____ ("Guarantor") and _____, residing at (Insert address) _____, IL (zip) _____, ("Property Owners").

RECITALS

WHEREAS, Property Owners own eligible Property as described herein ("Property"), that
Property having the legal description as follows:

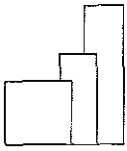
_____ Adams County,
Illinois.

WHEREAS, Guarantor has been granted approvals by Adams County Ordinance No. _____ for the construction and operation of a wind energy center consisting of up to # _____ turbines on properties located in unincorporated _____ Townships in Adams County, Illinois ["Wind Energy Center"];

WHEREAS, Guarantor desires to alleviate concerns and guarantee preservation of Property values of all Property located in proximity to the Wind Energy Center, specifically within two (2) miles of any wind turbine (measured from furthest reach of turbine blades to the Property); and WHEREAS, Guarantor is desires to provide for either continued occupancy of existing residences by Property Owners or otherwise not financially impacting neighboring Property Owners as a result of the Wind Energy project; and WHEREAS Property Owners are desirous of preserving equity in the Property, by ensuring that if the Property described herein is either diminished in value or sold at a price less than the ASKING PRICE as a result of proximity to the Wind Energy Center, as determined by the procedures contained herein, the Guarantor will guarantee payment to the Property Owners of such difference; or if Property owner is unable to sell the Property following a reasonable marketing period, as defined herein, the Guarantor will guarantee payment to the Property Owners of the full Appraised value and purchase the Property, as defined herein.

IT IS HEREBY AGREED AS FOLLOWS:

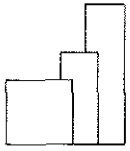
1. **EFFECTIVE DATE OF AGREEMENT.** This Agreement shall become effective and binding on Guarantor when signed by both parties. Notwithstanding the foregoing, if an administrative agency or court of competent jurisdiction rules or holds that the approvals



or permits issued by Adams County for the Wind Energy Center has been in excess of or in violation of said governmental body's authority or otherwise unlawful, and Guarantor has not constructed any of the wind turbines, then Guarantor's obligations under this Agreement shall be null and void. However, the construction of any or all of the proposed turbines shall render this agreement in full force and effect, and constitute the requirement of the Guarantor to fulfill all obligations to the Property owner, as defined herein.

2. ELIGIBILITY: EXERCISE OF GUARANTEE. (a) Property that is within two (2) miles of the tip of a turbine blade that is part of the Wind Energy Center is covered by this guarantee, to the extent the property is developed or approved for development on _____, the date Adams County voted to approve Ordinance No. _____ approving the Wind Energy Center ("Ordinance Date"). Owners of such Property who were owners of record as of the Ordinance Date ("Property Owners"), or their legitimate heirs or assigns as described in Paragraph 14, are eligible to exercise this guarantee. In the event that the Property Owners wish to sell their eligible Property, and exercise the guarantee set out in this Agreement, they shall notify Guarantor of same in writing by certified mail and thereafter they shall make a good faith effort to sell said Property by entering into a listing contract with a licensed real estate broker pursuant to the terms herein. (b) Property Owners shall have a period of ten (10) years to execute this agreement from the Ordinance date cited in paragraph 2.

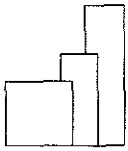
3. QUALIFIED PROFESSIONAL APPRAISER. For the purposes of this Agreement, a "qualified professional appraiser" shall mean a person who is licensed by the State of Illinois as a Certified General Appraiser or Licensed Residential Appraiser who (a) holds a valid Illinois license, (b) has not been subject to any suspension or revocation of license for any prior disciplinary action regarding their Illinois License by Illinois licensing authorities or from any professional association to which Appraiser is a member or affiliated with, and (c) has not been previously retained by either the wind energy industry or any citizens or citizens groups to opine in writing or in testimony as to wind energy projects effects on property values, hereafter deemed a "Qualified Professional Appraiser" (Appraiser), (d) is not related to the Property Owners, is not an employee or prior contractor of Guarantor or its affiliates and does not otherwise have a business relationship with Guarantor or Property Owners, and (e) who is a member of at least one national appraisal association that subscribes to the requirements of USPAP, (f) has at least 5 years experience in appraising and has worked within Adams County and/or any surrounding Counties during that period. (g) All appraisal reports shall conform to the Uniform Standards of Professional Appraisal Practice (USPAP), as required by current Illinois law. (h) The appraisal fee shall be paid in advance by the Guarantor to the County, for retention of the Appraiser by the County Attorney, who shall include a copy of this agreement to the Appraiser with the required fee, and a retention letter advising the Appraiser that the County, as a neutral party, is retaining the Appraiser and they are instructed to be independent of any influence from either party to this agreement. Guarantor agrees to reimburse the County for any services required of the Appraiser subsequent to delivery of the Appraisal Report, including but not limited to time expended responding to subpoena for testimony at deposition or trial.



4. **AGREED TO ASKING PRICE.** The ASKING PRICE is the value of the Property at the time the Property Owner decides to sell, with Property Owner discretion to either increase or decrease the asking price by no more than 5% difference with the Appraised Value. The ASKING PRICE of the Property may, however, be mutually agreed to by the Property Owners and the Guarantor. The ASKING PRICE may be mutually amended by agreement of the Property Owners and Guarantor at any time, subject to agreement.

5. **DETERMINATION OF ASKING PRICE BY APPRAISAL** If the parties are unable to agree on the ASKING PRICE of the Property prior to the Property Owner listing the Property for sale, then the Guarantor shall hire, at its expense, a second Appraiser and shall notify Property Owner of such Appraiser in writing with a resume or qualification summary for the Appraiser for review by the Property Owner. If the Property Owner objects to the Guarantor's choice of appraisers, it shall state those objections to Guarantor in writing within thirty (30) days of the notification of the choice of Appraiser. In the event Property Owner reasonably objects, the Guarantor shall choose another Appraiser, and proceed as described below. When a qualified professional appraiser is hired pursuant to this Paragraph 5, he or she shall be instructed to determine the market value which will become the ASKING PRICE, subject to Property Owner 5% discretion, of the Property as follows:

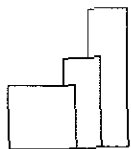
- a. Assume that no wind energy center or utility scale wind turbine(s) are located within two (2) miles of the Property;
- b. Utilize comparable sale data of property, developed as the Property was developed as of the Ordinance Date and located a minimum of two (2) miles distance away from the Wind Energy Center, or further so that in the opinion of the appraiser the selling price of that comparable property was not influenced by the presence of the Wind Energy Center or any other wind energy project;
- c. Utilize a minimum of three (3) comparable sale property, located approximately the same distance from major population centers (such as Quincy) so that in the opinion of the appraiser the selling price of the comparable property was not influenced by its closer or more distant proximity to new or existing population or employment centers.
- d. Establish the market value which is based upon the Property as developed on the Appraisal inspection date, with consideration of any normal or typical maintenance, repairs or additions made during the effective term of this agreement;
- e. Prepare a written narrative appraisal or residential form report supplemented as needed with written descriptions, analysis or comments, and which conforms to the requirements of USPAP;
- f. Prepare the appraisal in full compliance with any and all state standards and state regulations which pertain to the preparation of an appraisal of the Property except those standards and regulations which conflict with these instructions; and
- g. The appraiser shall note the condition of the premises, both interior and exterior, at the time of the appraisal.



If Property Owner and Guarantor accept the appraised value, then such value shall constitute the ASKING PRICE, and the Property Owners shall offer the above-described Property for sale at no less or more than a 5% difference with that price. If either the Property Owner or the Guarantor does not accept the appraised value, the non-accepting party may retain a second qualified professional Appraiser, of its choice, who shall not be made aware of the first appraised value and who shall determine the market value of the above-described Property on the basis of Paragraph 5(a) through (g) above. If both parties do not accept the original appraisal, they shall agree to the second qualified professional Appraiser and Guarantor shall pay the costs. In the event a second Appraisal is obtained pursuant to this paragraph and is within ten percent (10%) of the first Appraisal, the ASKING PRICE shall be the arithmetic average of the original appraised value and the second appraised value, unless the Guarantor or the Property Owner is unsatisfied with such Appraisal with specific reason(s) given in writing for disagreement with the Appraised value. In such event, the first two appraisers shall be instructed to agree on a third qualified professional Appraiser, at the sole expense of the Guarantor or the Property Owner, whichever is unsatisfied, unless both parties are unsatisfied in which case the expense shall be equally shared, and who shall not be made aware of either the first or second appraised values, and who shall determine the market value of the Property on the basis of Paragraph 4 (a) through (g) above. The ASKING PRICE will then be the arithmetic average of the three appraised values if the lowest value is no more than fifteen percent (15%) lower than the highest appraised value. If the fifteen percent (15%) range is exceeded the third Appraisal shall conclusively determine the ASKING PRICE for the purpose of this Agreement.

6. LISTING WITH BROKER. Property Owners shall utilize the services of a real estate broker/agent who shall be licensed in Illinois, is not financially affiliated with or related to the Appraiser, shall not be immediately related to the Property Owners or Guarantor as determined by being related no closer than second cousins and/or any history of sharing the same residence, and shall be a member of the Board of Realtors Multiple Listing Service or Exchange (Broker), unless these requirements are waived by the Guarantor upon the request of a Property Owner. Property Owners shall give Guarantor notice of the Broker with whom they wish to contract and shall obtain Guarantor's approval of said Broker within five (5) business days of written notice to Guarantor that Broker meets the no-relation requirement. Guarantor will not unreasonably withhold such approval and will confirm no relationship with Broker to the Property Owner. If the Guarantor objects to the Property Owners' choice of Broker, it shall state those objections, in writing to Property Owners. In the event Guarantor reasonably objects, the Property Owners shall choose another Broker, and proceed as described above. As sellers of the Property, Property Owners shall be responsible for the Brokerage commission or fee UNLESS the Property is purchased by Guarantor pursuant to Guarantor purchase of the Property after 180 days as provided for herein. Nothing herein shall prevent the Property Owner from selling the Property at a value higher than the ASKING PRICE as determined herein.

7. TERM OF LISTING. Property Owners shall list the Property, at the ASKING PRICE as determined in Paragraphs 4, 5 and 6, or at a higher value if agreed by Guarantor.



During the listing term, Property Owners shall accept any offer to purchase for the ASKING PRICE that is a bona-fide offer to purchase by a qualified buyer with a valid loan commitment or buyer otherwise acceptable to the Guarantor, provided that normal mortgage contingencies have been met or satisfied by buyer or waived by Property Owner and any home inspection contingency has been satisfied or waived by Property Owner. Said listing contract shall provide: (a) that the Broker shall list the Property in the multiple listing exchange; (b) that the Property will be so listed until the occurrence of either the (i) closed sale of the Property or (ii) expiration of a period of 180 days; (c) that the broker shall not be entitled to any commission after the expiration of the listing contract. The Property Owners shall cooperate with the Broker in obtaining a purchaser pursuant to the terms set forth in the listing agreement and shall make, in good faith, all reasonable efforts necessary to conclude a sale pursuant to the said terms. However, this shall not be construed as a requirement that Property Owner conceals their own experience with living in the Property, inclusive of any audible or inaudible noise effect emanating from the wind turbines.

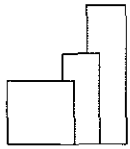
8. OFFERS TO PURCHASE. Property Owners shall provide the Guarantor with written notification of every written contract or Offer to Purchase that they receive for the Property and agree, for a period of 180 days, not to accept any offer below the ASKING PRICE without the express and written approval of the Guarantor, provided that Guarantor responds within twenty four 24 hours of Notice from Property Owner. In no event shall the Property Owners entertain anything other than good faith, bona fide offers of purchase.

9. GUARANTOR'S CONSENT TO PURCHASE. Guarantor shall have the right to make a non-contingent counter offer(s) on any offers of purchase which are more than 5% below the ASKING PRICE, said counter offer to be tendered to the purchaser within twenty four (24) hours of notification by the Property Owner of the offer of purchase. In the event the buyer accepts or meets any such counteroffer made or requested by the Guarantor, or in the event the Guarantor otherwise consents to a sale of the Property more than 5% below the ASKING PRICE, the Guarantor shall pay the Property Owners, at closing, the difference between the ASKING PRICE and the sale price so established.

10. SALE WITHOUT GUARANTOR CONSENT. If the Property Owners have not received an offer of purchase at the ASKING PRICE within 180 days of listing the Property for sale, or the Guarantor has not consented to the sale of the Property below the ASKING PRICE, the Property Owners may sell the Property at the highest offer of purchase still pending or at the next good faith bona fide offer to purchase. It shall notify the Guarantor, in writing, of its intention to accept such offer.

11. PROPERTY OWNER'S CLAIM.

(a) If the Property has sold for less than the ASKING PRICE, as determined herein, and Property Owner believes that the reason for such lowered value is because of the Wind Energy Center's proximity to the Property, Property Owner shall make a claim to the Guarantor, requesting payment for the difference between the ASKING PRICE and the



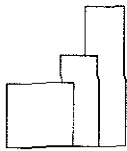
sales price. Within thirty (30) days of such request, Guarantor shall pay the Property Owner the difference unless Guarantor, within that time, has demonstrated that the sale is not a bona-fide transaction.

(b) If the Property Owner has not received an offer of purchase at the ASKING PRICE after 180 days of listing the Property for sale, Guarantor shall, within thirty (30) days of notification in writing purchase the Property for the ASKING PRICE, unless Guarantor, within that time, has demonstrated conclusively that Property Owner did not reasonably cooperate with the terms of a bona-fide sale contract.

© If the Property has not sold within 180 days of the Listing agreement, and Guarantor provides Multiple Listing Service statistics that demonstrate a median Marketing Time for all unincorporated Adams County residential properties is in excess of 180 days, as of the original Listing date, then Guarantor has the option of notifying the Property Owner that they must extend the Listing or enter into a separate listing agreement with a new Broker for a period of 180 days. If the extended Listing option pursuant to paragraph 11 © does not result in a bona-fide sale agreement within the second (2nd) 180 day Listing term, then Guarantor must abide by the terms of paragraph 11 (b) and buy the Property for an increased price as determined by the Appraised Value plus the most recent Consumer Price Index (CPI) multiplied by 50%.

12. AGRICULTURAL LAND. This agreement requires payment by the Guarantor to any non-participating agricultural land owners with Property located within 2 miles of the Wind Turbines, on the basis of increased costs, if any, resulting from AG property owners loss of aerial spraying services, provided that (a) Ag Property owner has utilized aerial spraying services for at least 1 of the last 3 years during crop seasons; (b) aerial spraying services either decline to continue service to the Ag Property in question as a direct result of pilot safety concerns from wind turbine structures or increase the cost of services to the Ag Property in question; (c) lower lease rates are agreed between Ag Property owner and tenant farmer as a result of tenant farmers increased costs described in paragraph 12 (a) and/or (b). Cost increases and Ag Property Owner compensation shall be based on either the actual cost increase for continued use of aerial spraying services active in Adams County or the actual contracted 3rd party cost of alternative application of AG chemicals minus the last documented cost for aerial application of AG chemicals. Guarantor shall be provided documented cost differences as soon as practical after costs are incurred by the Ag Property Owner, and shall submit payment to Ag Property Owner within 60 days of notice by Ag property Owner. However, Guarantor shall have the right to have cost information reviewed by and independent auditor during the 60 day period, and if payment due the Ag Property Owner is disputed by Guarantor, they shall have the right to submit the payment claims to arbitration in Adams County, Illinois.

13. TERMINATION OF GUARANTOR'S OBLIGATIONS. This Agreement shall terminate and Guarantor shall have no obligation to guarantee the Property value or purchase price once any wind turbines located within two (2) miles of the Property are decommissioned and demolished and operations at the Wind Energy Center have been permanently terminated as the result of any corporate decision, order, judgment, or



decree issued by a federal, state, or local agency, court, or unit of government having jurisdiction under administrative code, statute, law, or ordinances.

14. PROPERTY OWNER OPTION AND ALTERNATIVE TO RELOCATION. In the event that any Property Owner elects to remain in their home and not relocate pursuant to the preceding terms and conditions of the Property Value Guarantee, Property Owners located in the footprint or within one (1) mile of the perimeter of the footprint shall notify Guarantor within 3 years of commencement of operations of the Wind Energy Project that they are exercising their option under paragraph 14, and shall be compensated by the developer in a cash amount equal to 25% of the Appraised Value, as set forth in paragraph 5 of this agreement. Property Owners located between one (1) mile and two (2) miles of said footprint perimeter shall have 2 years to exercise the paragraph 14 option, and compensation shall be equal to 5% of the Appraised Value, as set forth in paragraph 5 of this agreement. Any exercise of the paragraph 14 Property Owner Option and payment to Property Owner by Guarantor shall constitute a full waiver and release of any future property value diminution claim or right to sell to the Guarantor as otherwise provided for in this agreement.

15. ASSIGNMENT OR TRANSFER. Neither this Agreement nor the rights under it may be assigned, conveyed, or otherwise transferred by Property Owners. The guarantee given by Guarantor to guarantee the Property value and to purchase the Property is personal, and does not run with the land; however, said Agreement shall inure to the benefit of the Property Owners, their personal representatives, trustees, guardians, custodians or their heirs; but, in all events, shall terminate after any closed sale of the Property.

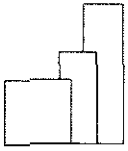
16. APPLICATION OF LAW DISPUTES. This Agreement shall be construed consistent with law in the State of Illinois. Disputes concerning the application or terms of this Agreement shall be subject to the circuit court jurisdiction of Adams County.

GUARANTOR:

By _____
Name Title Date

PROPERTY OWNERS:

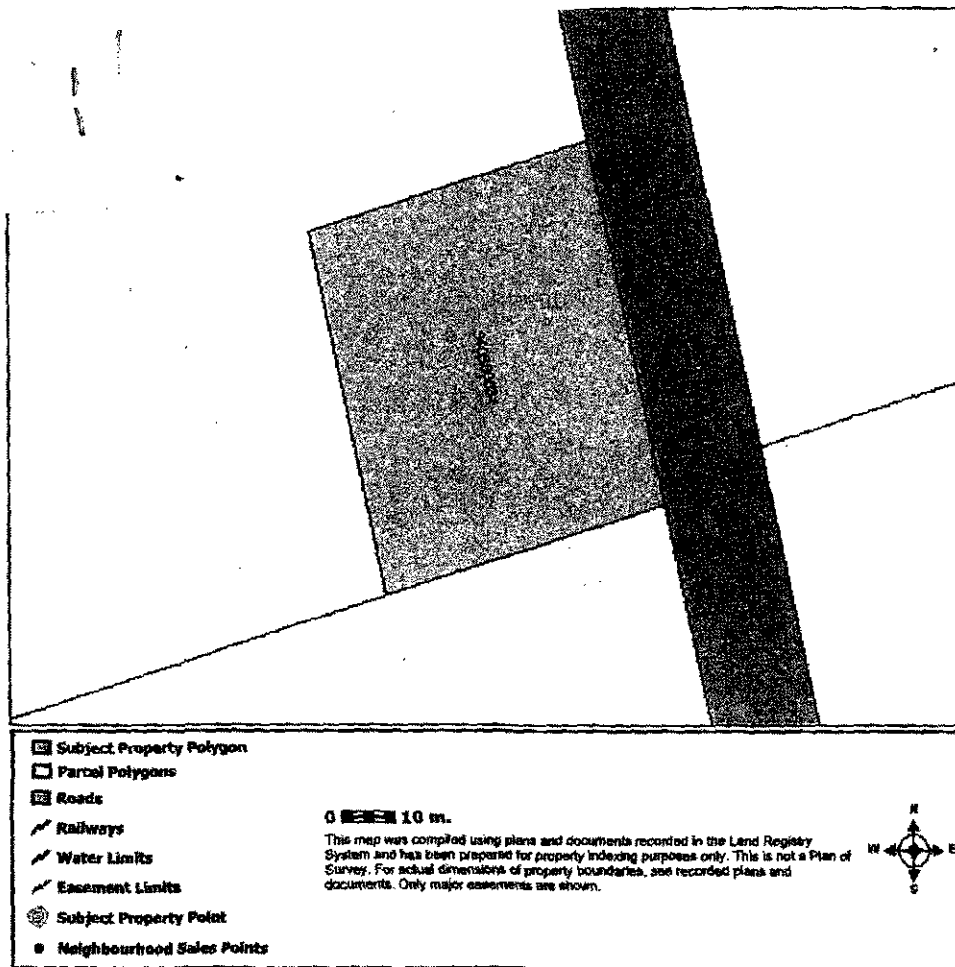
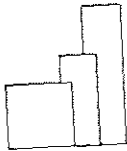
By _____
Name Date



McCann Appraisal, LLC

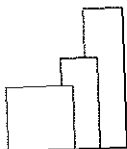
Notary _____

Appendix B



SUBJECT PROPERTY IDENTIFICATION INFORMATION

LRO	07
PIN	340560031
ASSESSMENT ROLL NUMBER	220800000409590
REGISTRATION TYPE	LT
LAND REGISTRY STATUS	ACTIVE
MUNICIPALITY	N/A
ADDRESS	N/A
AREA	4052 m ²
PERIMETER	258 m



McCann Appraisal, LLC

DESCRIPTION		PT LT 29 CON 7, PT 1 7R742 ; AMARANTH		
PARTY TO:		ASHBEE, BARBARA JOAN		
SALES HISTORY				
INSTRUMENT NUMBER	REGISTRATION DATE	CONSIDERATION VALUE	INSTRUMENT TYPE	PARTY TO
DC43624	01/31/2005	204750	T	ASHBEE, BARBARA JOAN
MF212464	06/30/1994		T	

Reports Not the Official Record. Reports, other than the Parcel Register, obtained through Geowarehouse are not the official government record and will not necessarily reflect the current status of interests in land.

Currency of Information. Data contained in the Geowarehouse reports are not maintained real-time. Data contained in reports, other than the Parcel Register, may be out of date ten business days or more from data contained in POLARIS.

Coverage. Data, information and other products and services accessed through the Land Registry Information Services are limited to land registry offices in the areas identified on the coverage map.

Completeness of the Sales History Report. Some Sales History Reports may be incomplete due to the amount of data collected during POLARIS title automation. Subject properties may also show nominal consideration or sales price (e.g. \$2) in cases such as transfers between spouses or in tax exempt transfers.

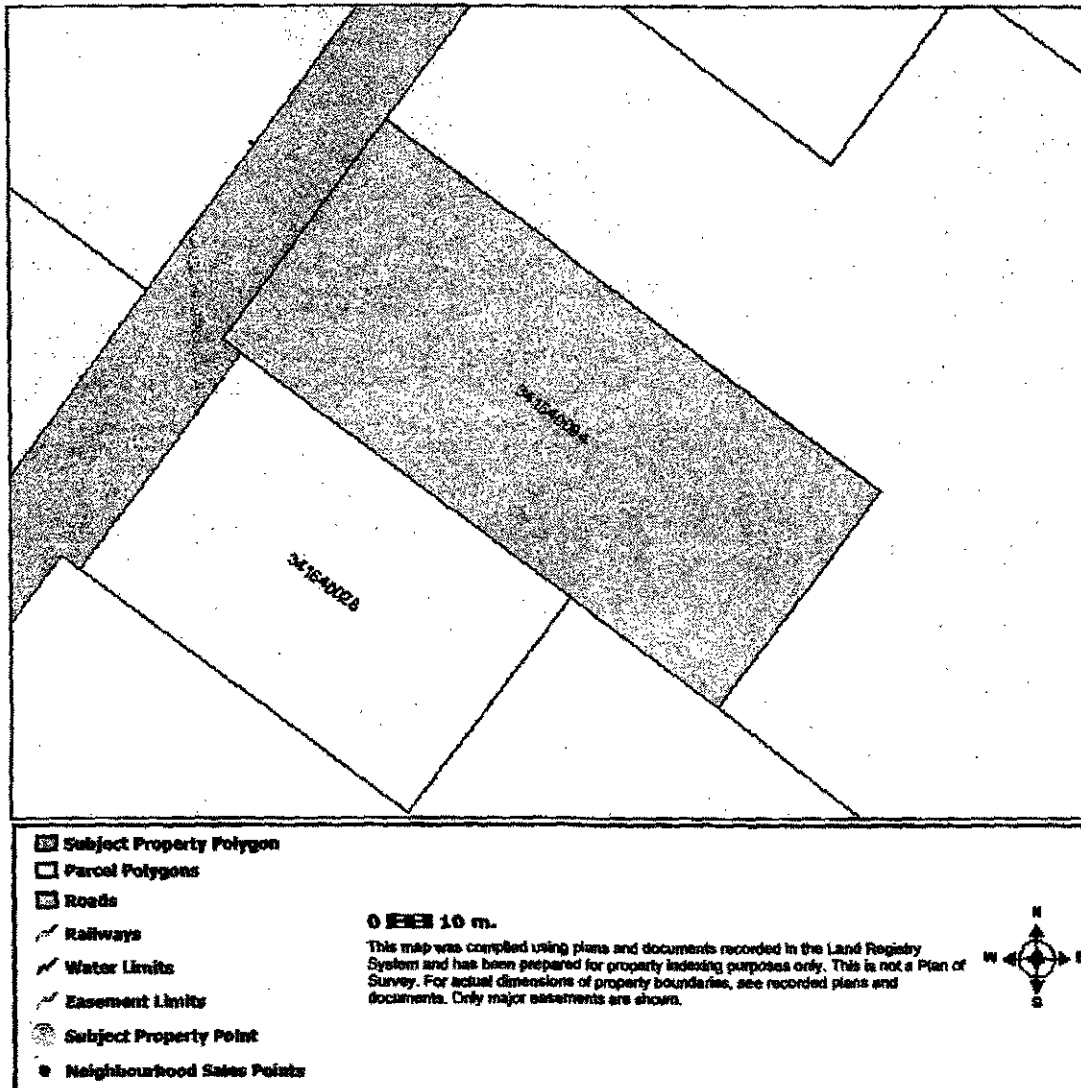
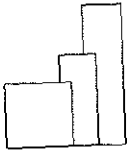
The Property Information Services, reports and information are provided "as is" and your use is subject to the applicable Legal Terms and Conditions. Some information obtained from the Land Registry Information Services is not the official government record and will not reflect the current status of interests in land. Use of personal information contained herein shall relate directly to the purpose for which the data appears in land registry records and is subject to all applicable privacy legislation in respect of personal information. Such information shall not be used for marketing to a named individual.
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☒ Subject Property Polygon
☐ Parcel Polygons
☒ Roads
☒ Railways
☒ Water Limits
☒ Easement Limits
☒ Subject Property Point
☒ Neighbourhood Sales Points

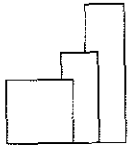
0 NE 10 m.

This map was compiled using plans and documents recorded in the Land Registry System and has been prepared for property indexing purposes only. This is not a Plan of Survey. For actual dimensions of property boundaries, see recorded plans and documents. Only major easements are shown.

SUBJECT PROPERTY IDENTIFICATION INFORMATION	
LRO	07
PIN	340560031
ASSESSMENT ROLL NUMBER	220800000409590
REGISTRATION TYPE	LT
LAND REGISTRY STATUS	ACTIVE
MUNICIPALITY	N/A
ADDRESS	N/A
AREA	4052 m2
PERIMETER	258 m



SUBJECT PROPERTY IDENTIFICATION INFORMATION	
LRO	07
PIN	341540094
ASSESSMENT ROLL NUMBER	N/A
REGISTRATION TYPE	LT
LAND REGISTRY STATUS	ACTIVE
MUNICIPALITY	N/A
ADDRESS	58232 COUNTY ROAD, R.R. 6
AREA	8408 m2
PERIMETER	398 m
DESCRIPTION	PT LT 291, CON 2 SWTS, PT 2, 7R4396 ; MELANCTHON
PARTY TO:	CANADIAN HYDRO DEVELOPERS INC.



McCann Appraisal, LLC

SALES HISTORY

INSTRUMENT NUMBER	REGISTRATION DATE	CONSIDERATION VALUE	INSTRUMENT TYPE	PARTY TO
DC48597	06/30/2005	299000	T	CANADIAN HYDRO DEVELOPERS INC.
LTD33017	01/12/2001		T	WILLIAMS, SANDRA MARIE BLANCHE; WILLIAMS, STEPHEN ROGER BLAINE
LTD11538	07/31/1998		T	
MF229782	08/08/1997		T	

Reports Not the Official Record. Reports, other than the Parcel Register, obtained through Geowarehouse are not the official government record and will not necessarily reflect the current status of interests in land.

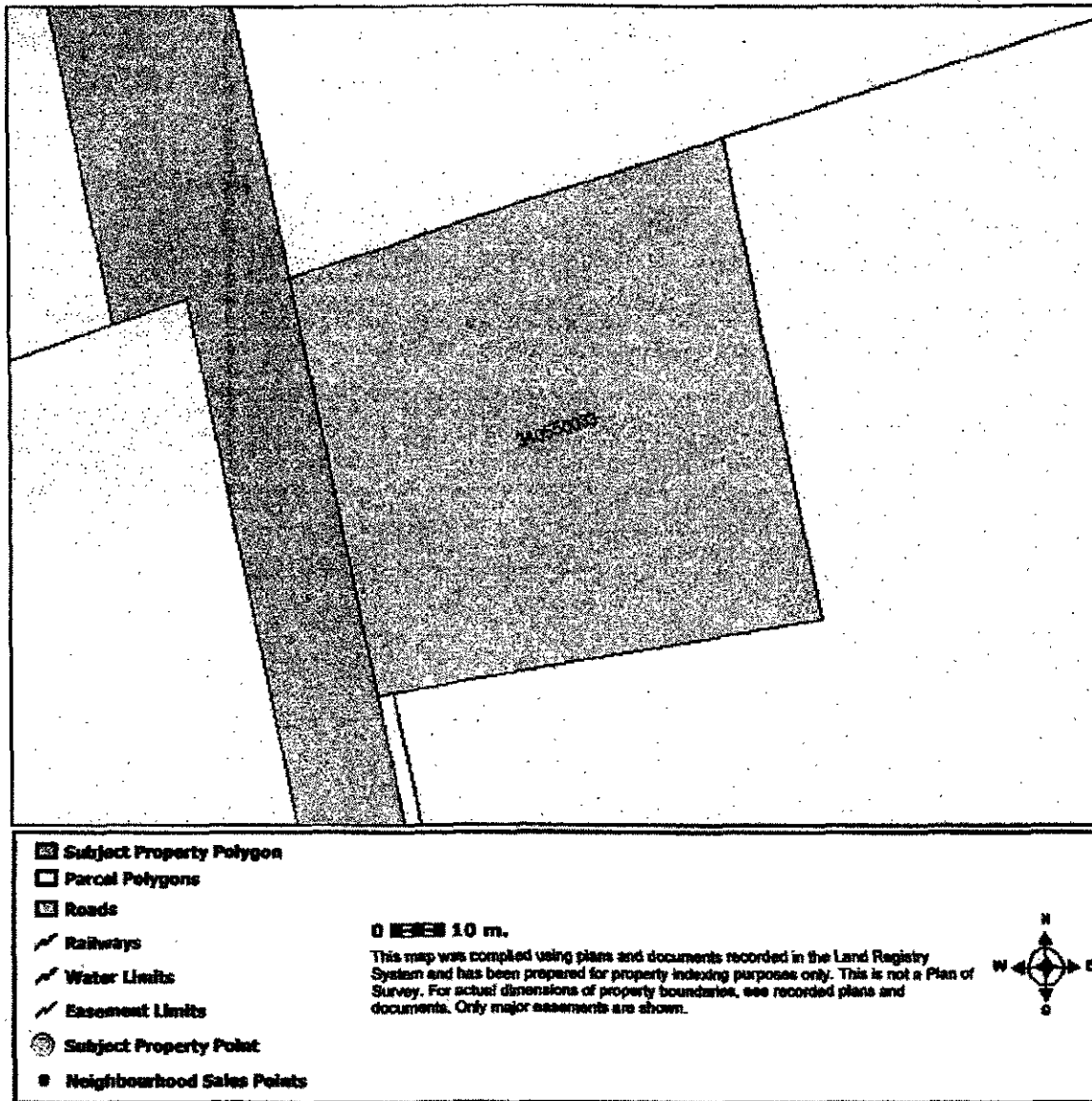
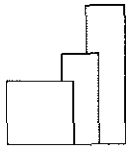
Currency of Information. Data contained in the Geowarehouse reports are not maintained real-time. Data contained in reports, other than the Parcel Register, may be out of date ten business days or more from data contained in POLARIS.

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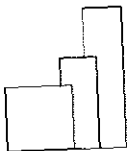
Completeness of the Sales History Report. Some Sales History Reports may be incomplete due to the amount of data collected during POLARIS title automation. Subject properties may also show nominal consideration or sales price (e.g. \$2) in cases such as transfers between spouses or in tax exempt transfers.

The Property Information Services, reports and information are provided "as is" and your use is subject to the applicable Legal Terms and Conditions. Some information obtained from the Land Registry Information Services is not the official government record and will not reflect the current status of interests in land. Use of personal information contained herein shall relate directly to the purpose for which the data appears in land registry records and is subject to all applicable privacy legislation in respect of personal information. Such information shall not be used for marketing to a named individual.

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SUBJECT PROPERTY IDENTIFICATION INFORMATION	
LRO	07
PIN	340550033
ASSESSMENT ROLL NUMBER	220800000321580
REGISTRATION TYPE	LT
LAND REGISTRY STATUS	ACTIVE
MUNICIPALITY	N/A
ADDRESS	N/A
AREA	7622 m2
PERIMETER	350 m
DESCRIPTION	PT LT 29, CON 5, PT 1, 7R787 ; AMARANTH
PARTY TO:	CANADIAN HYDRO DEVELOPERS, INC.



McCann Appraisal, LLC

SALES HISTORY

INSTRUMENT NUMBER	REGISTRATION DATE	CONSIDERATION VALUE	INSTRUMENT TYPE	PARTY TO
DC81185	11/15/2007	500000	T	CANADIAN HYDRO DEVELOPERS, INC.
LTD11172	07/20/1998		T	BROWNELL, ROY; BROWNELL, TERESA
MF124008	05/15/1984		T	

Reports Not the Official Record. Reports, other than the Parcel Register, obtained through Geowarehouse are not the official government record and will not necessarily reflect the current status of interests in land.

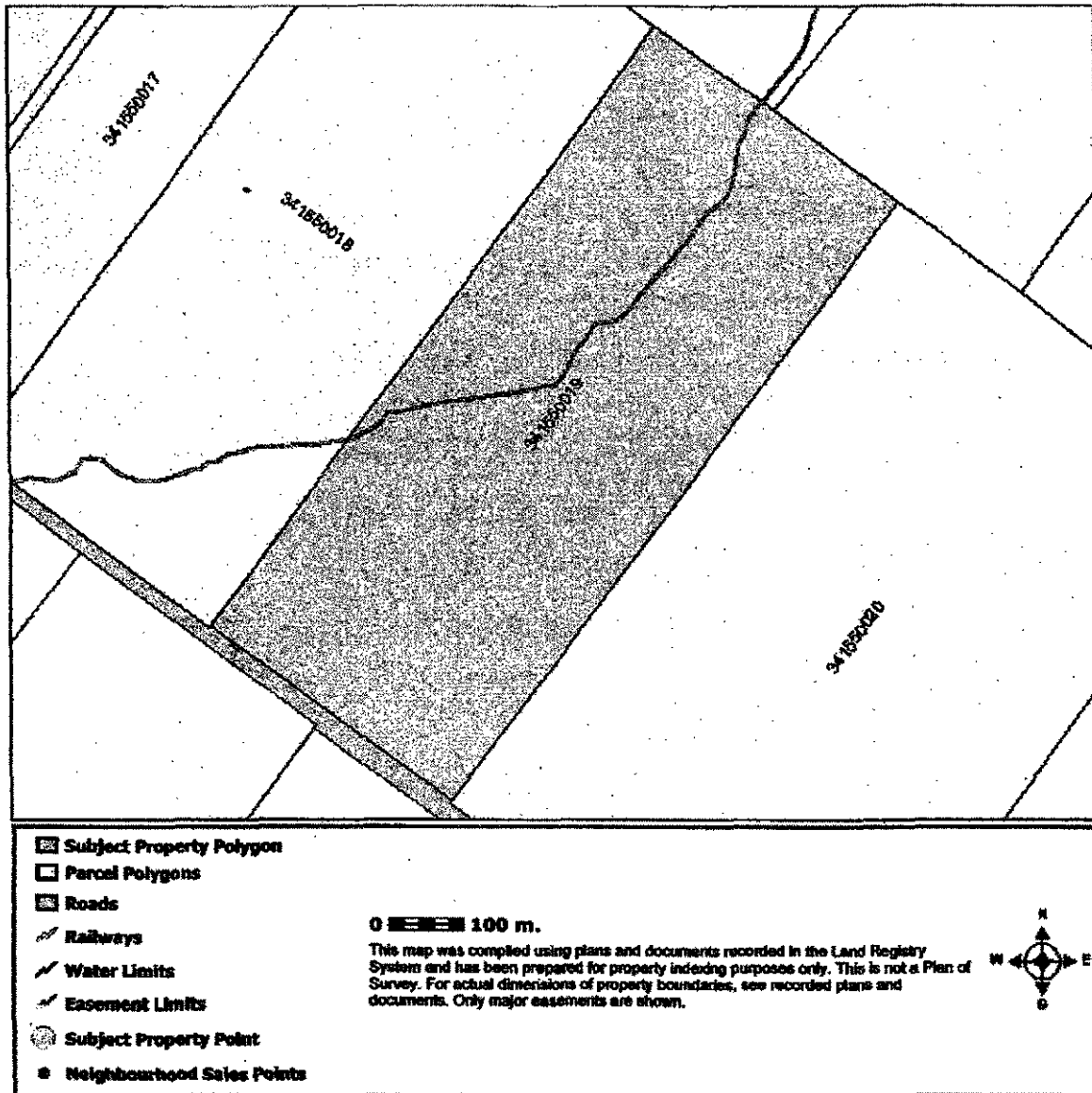
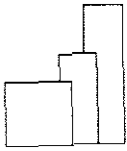
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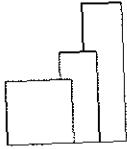
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SUBJECT PROPERTY IDENTIFICATION INFORMATION	
LRO	07
PIN	341550019
ASSESSMENT ROLL NUMBER	221900000521900
REGISTRATION TYPE	LT
LAND REGISTRY STATUS	ACTIVE
MUNICIPALITY	N/A
ADDRESS	N/A
AREA	409793 m2
PERIMETER	2836 m
DESCRIPTION	PT LTS 284 & 285, CON 4 SWTS AS IN MF163913 ; MELANCTHON
PARTY TO:	CANADIAN HYDRO DEVELOPERS, INC.



McCann Appraisal, LLC

Sales History

INSTRUMENT NUMBER	REGISTRATION DATE	CONSIDERATION VALUE	INSTRUMENT TYPE	PARTY TO
DC80536	10/30/2007	350000	T	CANADIAN HYDRO DEVELOPERS, INC.
MF163913	12/09/1988		T	BENVENETE, WALTER MARK

Reports Not the Official Record. Reports, other than the Parcel Register, obtained through Geowarehouse are not the official government record and will not necessarily reflect the current status of interests in land.

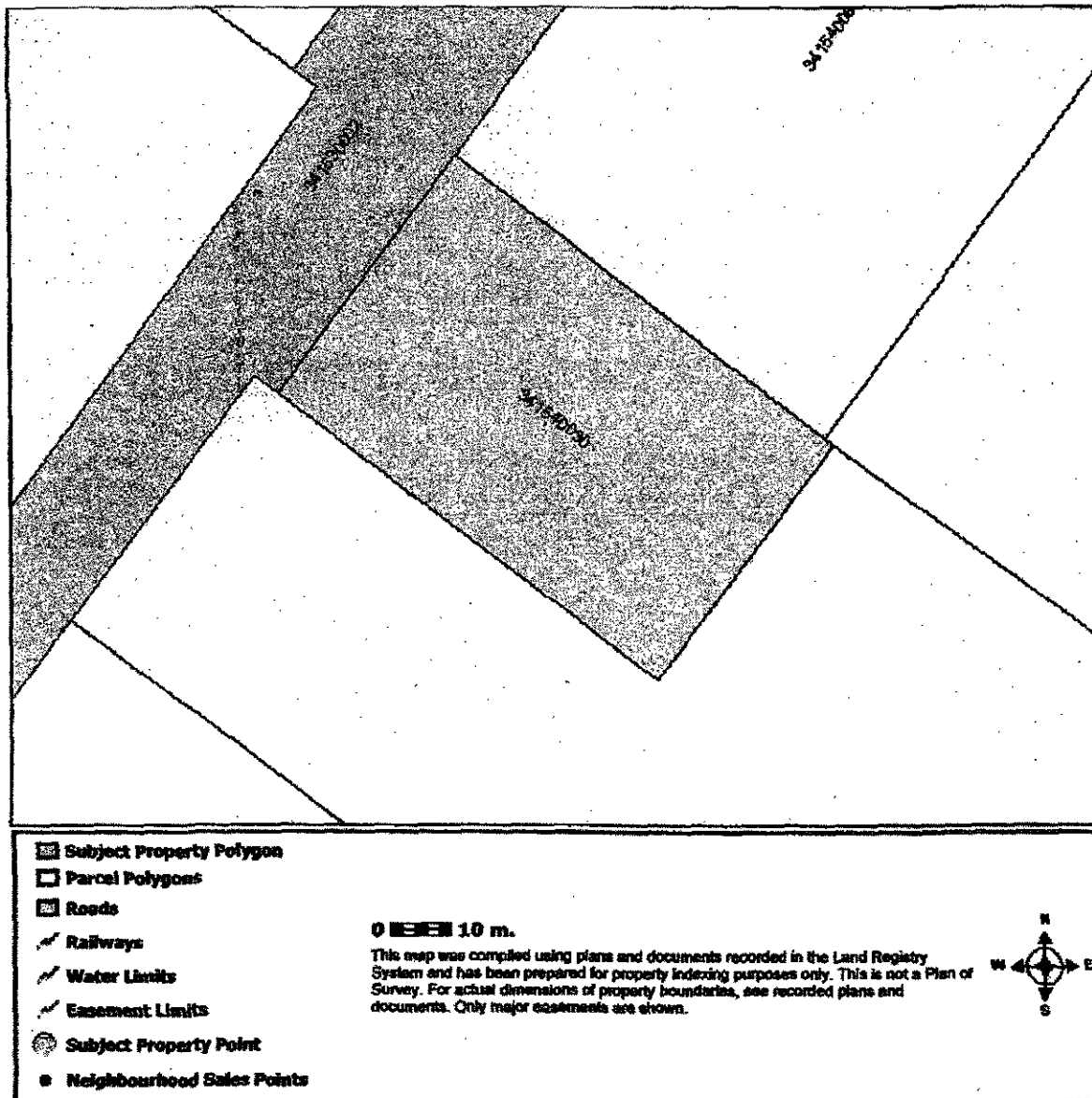
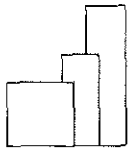
Currency of Information. Data contained in the Geowarehouse reports are not maintained real-time. Data contained in reports, other than the Parcel Register, may be out of date ten business days or more from data contained in POLARIS.

Coverage. Data, information and other products and services accessed through the Land Registry Information Services are limited to land registry offices in the areas identified on the coverage map.

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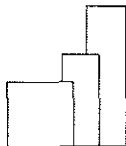
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SUBJECT PROPERTY IDENTIFICATION INFORMATION

LRO	07
PIN	341540030
ASSESSMENT ROLL NUMBER	22190000613850
REGISTRATION TYPE	LT
LAND REGISTRY STATUS	ACTIVE
MUNICIPALITY	SHELBURNE
ADDRESS	58234 COUNTRY ROAD 17
AREA	4048 m ²
PERIMETER	262 m
DESCRIPTION	PT LT 291, CON 2 SWTS, PT 2, 7R924 ; MELANCHTON
PARTY TO:	CANADIAN HYDRO DEVELOPERS, INC.



Sales History

INSTRUMENT NUMBER	REGISTRATION DATE	CONSIDERATION VALUE	INSTRUMENT TYPE	PARTY TO
DC77599	08/17/2007	302670	T	CANADIAN HYDRO DEVELOPERS, INC.
MF68694	03/11/1975		T	FRASER, BRUCE; FRASER HELEN

Reports Not the Official Record. Reports, other than the Parcel Register, obtained through Geowarehouse are not the official government record and will not necessarily reflect the current status of interests in land.

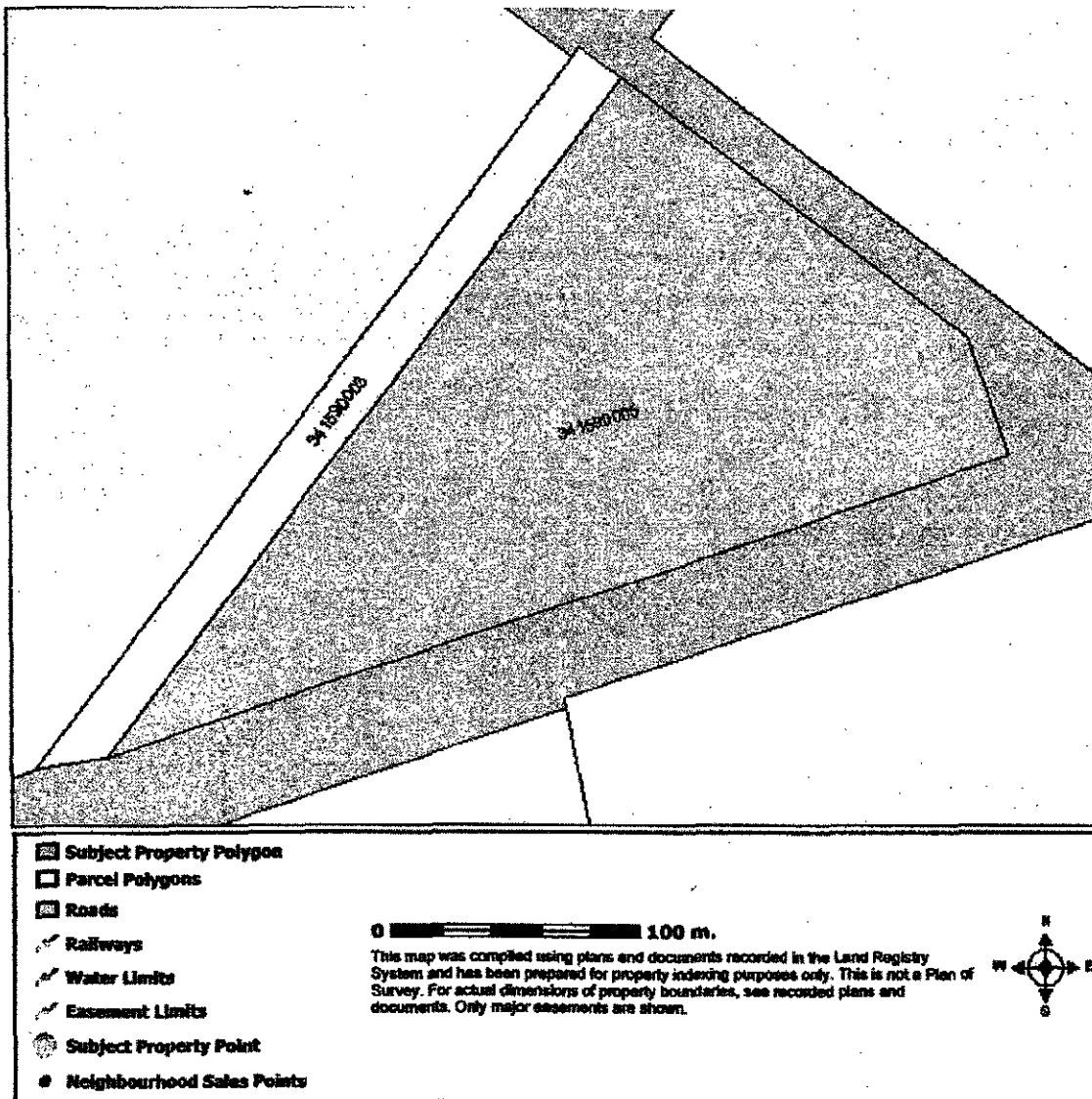
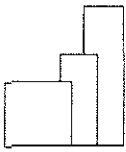
Currency of Information. Data contained in the Geowarehouse reports are not maintained real-time. Data contained in reports, other than the Parcel Register, may be out of date ten business days or more from data contained in POLARIS.

Coverage. Data, information and other products and services accessed through the Land Registry Information Services are limited to land registry offices the areas identified on the [coverage map](#).

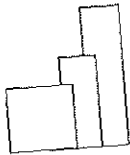
Completeness of the Sales History Report. Some Sales History Reports may be incomplete due to the amount of data collected during POLARIS title automation. Subject properties may also show nominal consideration or sales price (e.g. \$2) in cases such as transfers between spouses or in tax exempt transfers.

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SUBJECT PROPERTY IDENTIFICATION INFORMATION	
LRO	07
PIN	341590005
ASSESSMENT ROLL NUMBER	221900000401800
REGISTRATION TYPE	LT
LAND REGISTRY STATUS	ACTIVE
MUNICIPALITY	N/A
ADDRESS	N/A
AREA	40515 m2
PERIMETER	965 m
DESCRIPTION	PT LT 1, CON 5 SWTS AS IN MF157736 ; MELANCTHON
PARTY TO:	CANADIAN HYDRO DEVELOPERS, INC.



McCann Appraisal, LLC

Sales History

INSTRUMENT NUMBER	REGISTRATION DATE	CONSIDERATION VALUE	INSTRUMENT TYPE	PARTY TO
DC70069	01/31/2007	305000	T	CANADIAN HYDRO DEVELOPERS, INC.
LTD9504	05/15/1998		T	BARLOW, DAVID CHARLES; BARLOW, SHERYL ANN
MF157736	06/15/1988		T	

Reports Not the Official Record. Reports, other than the Parcel Register, obtained through Geowarehouse are not the official government record and will not necessarily reflect the current status of interests in land.

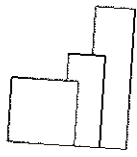
Currency of Information. Data contained in the Geowarehouse reports are not maintained real-time. Data contained in reports, other than the Parcel Register, may be out of date ten business days or more from data contained in POLARIS.

Coverage. Data, information and other products and services accessed through the Land Registry Information Services are limited to land registry offices in the areas identified on the coverage map.

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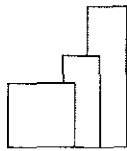
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Appendix C



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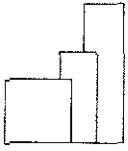
Mendota Hills Wind Energy Project

Sale #	Address	Sale Date	Price	Grantor	Grantee	Style	Size SF	\$/SF
1	629 W. Chestnut	Oct 2003	\$37,000	Estes	Lipe	1.5	1,161	\$31.87
2	323 W. Chestnut	Oct 2004	\$40,000	Reed	Hovious	1.5	1,425	\$28.07
3	1019 Steward Rd.	May 2003	\$40,000	Houle-Ward	Reyns	2	1,408	\$28.41
4	91143 Paw Paw	Mar 2005	\$187,000	Zaylik	Pachero	2	1,571	\$119.03
5	1224 IL Rte. 251	Jun 2003	\$138,000	Gittleson	Kowalski	2	1,272	\$108.49
6	339 Chestnut St.	Jan 2003	\$72,000	White	Flynn	2	1,664	\$42.76
7	630 W. Chestnut	Sep 2003	\$126,000	Eddy	Morath, Sr.	1.5	1,728	\$72.92
8	427 Chestnut St.	Oct 2003	\$87,000	Hesik	Rourke, Jr.	1.5	1,380	\$63.04
9	138 Cherry St.	Sep 2004	\$80,000	Hammond	Alexander	1.5	1,326	\$60.33
10	536 W. Cherry	Oct 2004	\$63,500	Johnson	Fitzpatrick	1.5	999	\$63.56
11	885 Compton Rd.	Oct 2004	\$68,900	Boysen	Gellings	1	480	\$143.54
12	518 W. Cherry St.	Apr 2003	\$87,500	Allen	Beckman	1	927	\$94.39
13	222 Maple St.	Dec 2004	\$150,000	Clark	Cummings	1	1,852	\$80.99
14	444 W. Main St.	Mar 2005	\$109,900	Miller	Michaels	1	1,402	\$78.39
15	2874 Beemerville	Jul 2003	\$367,000	Finkboner	DGNB TRT	1	2,201	<u>\$166.74</u>
Average sale price								<u>\$78.84</u>
16	1310 Melugins Grove	Apr 2004	\$179,000	Lyons	Overton	2	1,952	\$91.70
17	2612 Shady Oaks Rd.	Apr 2003	\$131,000	Smith	Papiech	1.5	1,208	\$108.44
18	3448 Cyclone Rd.	Mar 2003	\$105,900	Munyon	Pippenger	2	1,456	\$72.73
19	2524 Johnson St.	Aug 2004	\$61,800	Copeland	Lampson	1.5	948	\$65.19
20	741 Third St.	Feb 2004	\$63,500	Eckhardt	Rosales	1.5	868	\$73.18
21	613 Church Rd.	May 2003	\$115,000	Merkel	Parpart	1.5	1,458	\$78.88
22	3435 Willow Creek	Jun 2003	\$118,000	Swiatek	Brydun	2	884	\$133.48
23	3021 Cottage Hill	Mar 2005	\$182,000	Russ	Curtis	1.5	1,239	\$146.89
24	3385 Willow Creek	Mar 2003	\$180,000	McCoy	Carver	2	2,840	\$63.38
25	745 Second St.	Dec 2004	\$59,000	Wilson	Calderon	1.5	1,161	\$50.82
26	761 4th St.	Mar 2003	\$68,000	Stewart	Elsinger	1	724	\$93.92
27	2774 Welland Rd.	Apr 2003	\$93,000	Batha	Crumpton	1.5	1,104	\$84.24
28	558 Earlville Rd.	Jan 2003	\$145,000	Hodge	Ikeler	2	1,280	\$113.28
29	2505 Wood St.	Aug 2004	\$105,000	Janiak	Bullock	2	1,812	\$57.95
30	385 Earlville Rd.	Aug 2004	\$280,000	Rago	Diehl	2	2,142	\$130.72
31	3095 Cyclone Rd.	Dec 2004	\$169,900	Summerhill	Rainbolt	2	2,048	\$82.96
32	742 Second St.	Jan 2003	\$103,000	Delhotal	Stewart	2	1,876	\$54.90
33	395 Angling Rd.	Mar 2005	\$119,000	BMW Prop.	Herendeen	1	680	\$175.00
34	2515 Wood St.	Apr 2004	\$80,000	Jones	Sarver	1	912	\$87.72
35	1218 Locust Rd.	Jan 2005	\$169,000	Wachowski	Gembeck	1	1,040	\$162.50
36	901 Melugins Grove	Aug 2003	\$228,000	Kidd	Rajan	1	2,000	\$114.00
37	1490 German Rd.	Aug 2004	\$85,000	Firlit	Challand	2	2,144	\$39.65
38	603 Ogee Rd.	Apr 2004	\$285,000	Anderson	Miller	1	1,920	\$148.44
39	546 Camahan Rd.	Jan 2005	\$110,000	Coley	Sarabia	1	1,296	\$84.88
40	1353 County Line	Nov 2003	\$185,000	Vallejo	Bozaeth	1.5	1,338	\$138.27
41	2512 Johnson St.	Feb 2005	\$123,000	Montavon	Sutton	2	2,232	\$55.11
42	2509 Herman Rd.	Apr 2004	\$142,900	Bresson	Arjes	1	1,404	\$101.78
43	955 Woodlawn	Jul 2003	\$265,000	Swan	LaRosa	1.5	1,918	\$138.16
44	1279 Locust Rd.	Mar 2003	\$270,000	Witte	olin	1	2,156	\$125.23
45	648 Ogee	Nov 2003	\$225,000	Fickenscher	Rojas	1	1,768	\$127.26
46	1339 Woodlawn Rd.	Sep 2003	\$230,000	Howell	Bamhill	1	1,701	\$135.21
47	1349 Woodlawn Rd.	May 2003	\$207,500	Howell	Wiskari	1	1,809	\$114.70
48	711 O'Gee Rd.	Aug 2004	\$185,000	Groevengoed	Carabal	1	1,352	\$136.83
49	1295 Locust Rd.	May 2004	\$300,000	Hagan	Lowe	1	2,672	\$112.28
50	860 Paw Paw Rd.	May 2004	\$185,000	Wiskur	Pogreba	1	1,148	\$161.15
51	3011 Honeysuckle	Mar 2005	\$355,000	Abbott	Brandt	2	3,655	\$97.13
52	489 Earlville Rd.	Nov 2004	\$165,000	Schlaefke	Fromhertz	2	1,400	\$127.86
53	2512 Shaw Rd.	Jun 2004	\$153,500	Hlavin	Kapinski	2	1,638	<u>\$93.71</u>
Average sale price								<u>\$104.72</u>

Sales 17 - 53 located > 2 miles from turbines \$104.72 sq ft
 Sales 1 - 16 located within 2 miles of turbines \$78.84 sq ft

Difference in sale price per square foot \$25.89 sq ft

Average Value diminution within 2 miles of turbines 25%



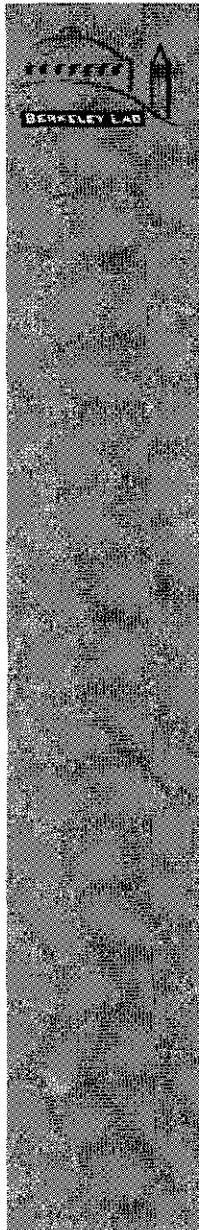
McCann Appraisal, LLC

Appendix D



McCann Appraisal, LLC

LBNL-2829E



**ERNEST ORLANDO LAWRENCE
BERKELEY NATIONAL LABORATORY**

**The Impact of Wind Power Projects
on Residential Property Values in
the United States:
A Multi-Site Hedonic Analysis**

**Ben Hoen, Ryan Wiser, Peter Cappers,
Mark Thayer, and Gautam Sethi**

**Environmental Energy
Technologies Division**

December 2009

Download from <http://eetd.lbl.gov/EA/EMP>

The work described in this report was funded by the Office of Energy Efficiency and Renewable Energy (Wind & Hydropower Technologies Program) of the U.S. Department of Energy under Contract No. DE-AC02-05CH1123.

This report was prepared by the above authors for the U.S. Department of Energy under Contract No. DE-AC02-05CH1123.

It has been reported that the contractors payment for the report was \$500,0000.

The following Figures ES-1, ES-2, ES-4 and photograph Appendix D & E were copied from this report without any editing by McCann Appraisal, LLC.

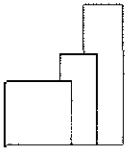


Figure ES-1: Base Model Results: Area and Nuisance Stigma

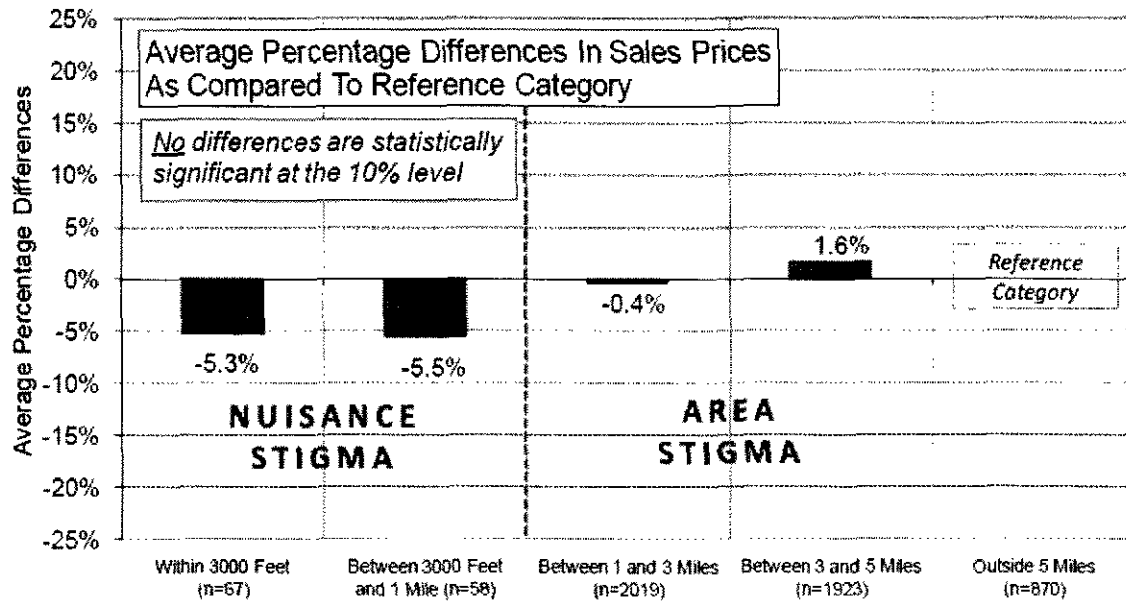
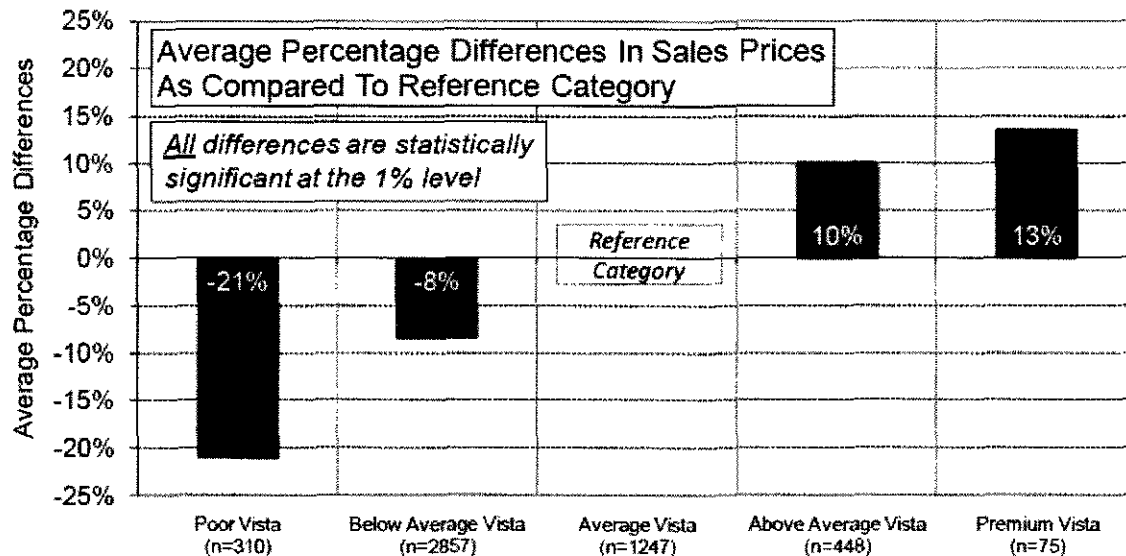
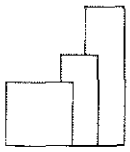


Figure ES-2: Base Model Results: Scenic Vista



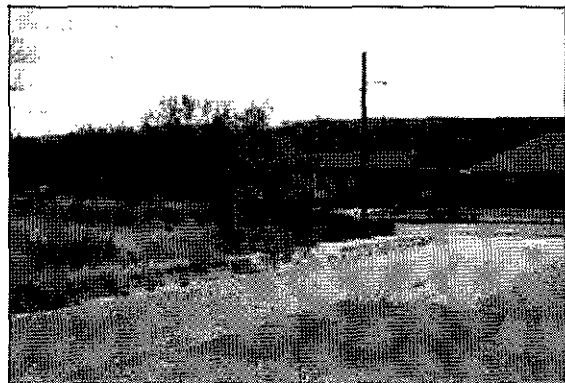


Appendix D: Vista Ratings with Photos

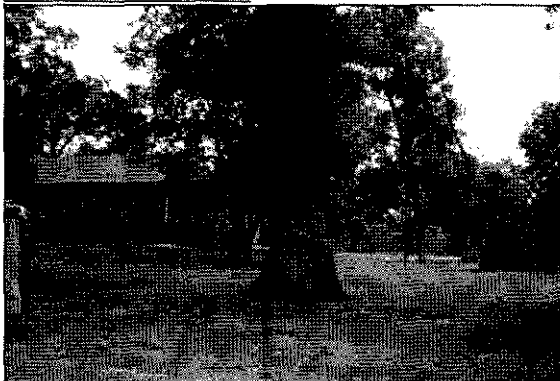
POOR VISTA

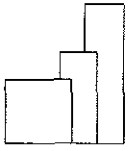


BELOW AVERAGE VISTA



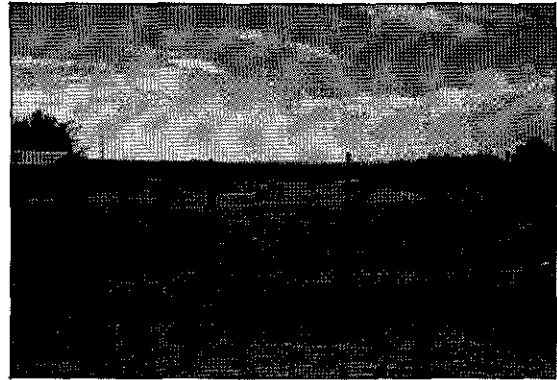
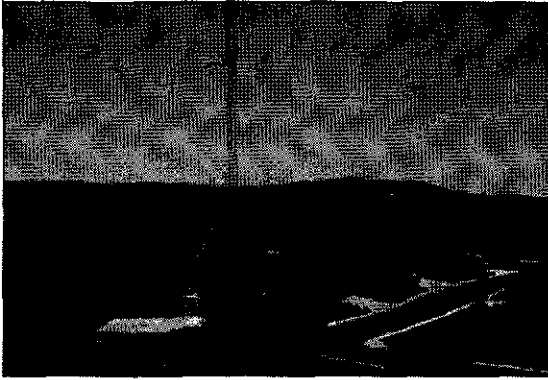
AVERAGE VISTA



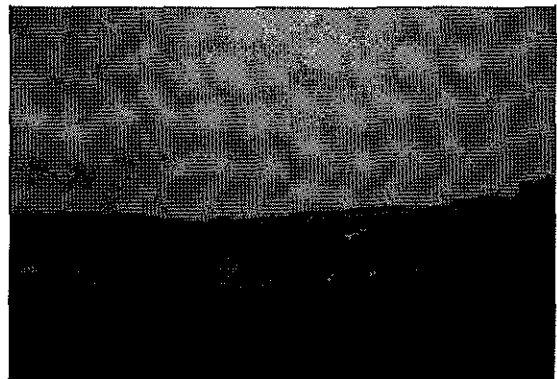


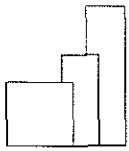
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ABOVE AVERAGE VISTA



PREMIUM VISTA



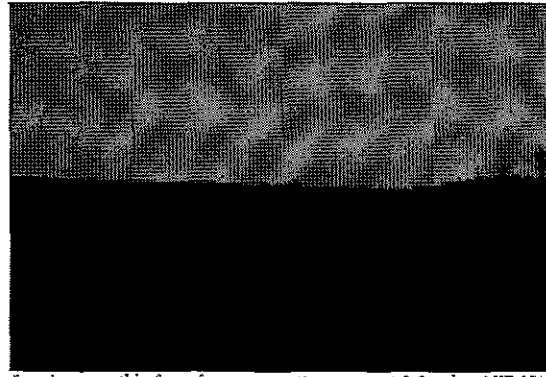


Appendix E: View Ratings with Photos

MINOR VIEW

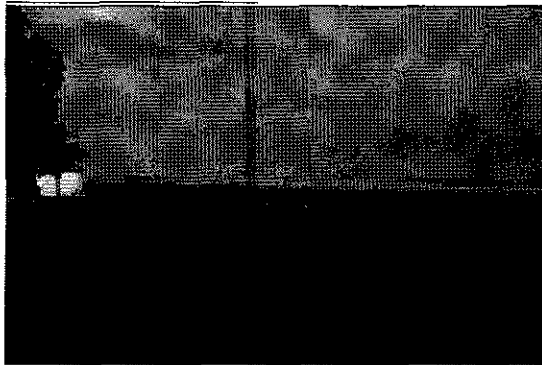


3 turbines visible from front orientation, nearest 1.4 miles (TXHC)

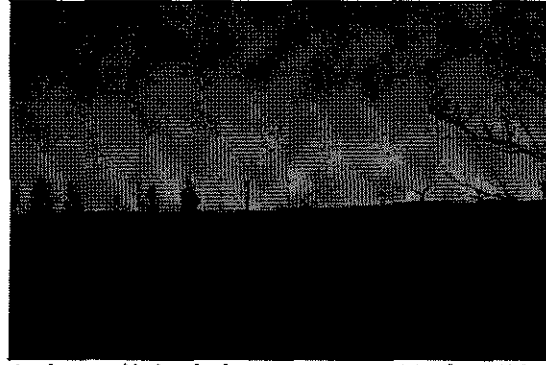


5 turbines visible from front orientation, nearest 0.9 miles (NIMC)

MODERATE VIEW



18 turbines visible from back orientation, nearest 1.6 miles (ILLC)



6 turbines visible from back orientation, nearest 0.8 miles (PASC)

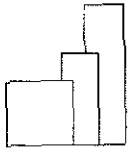
SUBSTANTIAL VIEW



90 turbines visible from all orientations, nearest 0.6 miles (LABV)



27 turbines visible from multiple orientations, nearest 0.6 miles (TXHC)

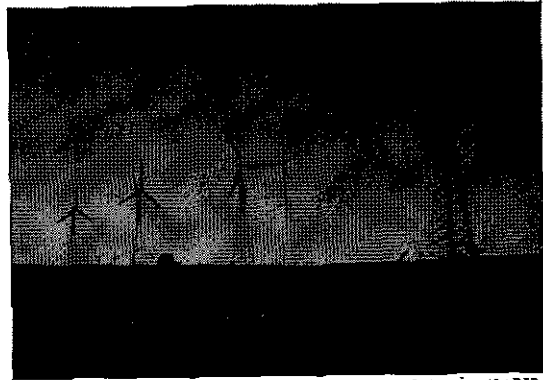


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EXTREME VIEW



6 turbines visible from multiple orientations, nearest 0.2 miles (WIKDC)



212 turbines visible from all orientations, nearest 0.4 miles (LABV)

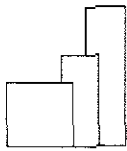
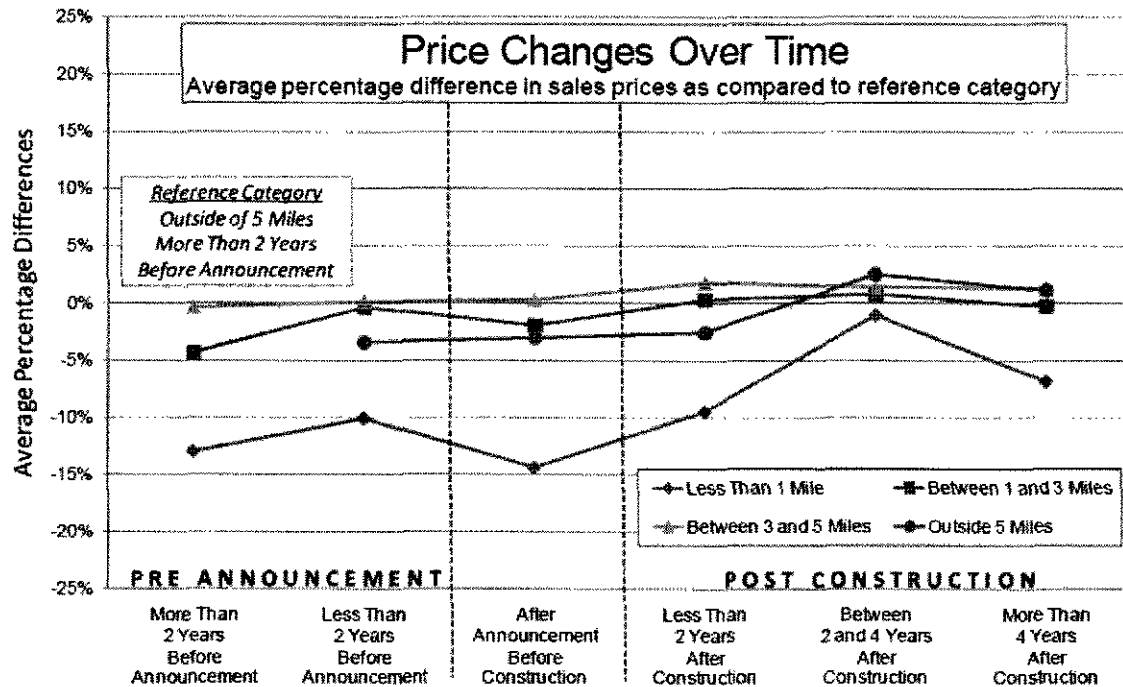
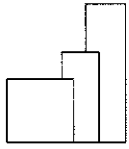


Figure ES - 4: Temporal Aspects Model Results: Area and Nuisance Stigma



The reference category consists of transactions of homes situated more than five miles from where the nearest turbine would eventually be located and that occurred more than two years before announcement of the facility



Property values blowing in the wind

REALTOR'S REPORT: Proposed turbine projects put damper on residential property sales in Cape Vincent

By NANCY MADSEN

TIMES STAFF WRITER

WEDNESDAY, APRIL 7, 2010

Sales records show that Cape Vincent has had a steeper decline in residential property sales than its neighbors and real estate professionals are starting to blame proposed wind power developments.

"People do not want to buy near windmills," said Amanda J. Miller, owner of Lake Ontario Realty, Dexter, who specializes in waterfront property sales. "They avoid purchasing in towns like Cape Vincent."

She presented her views and a report on property values to the Jefferson County Board of Legislators on Tuesday night.

In other countries that have had wind power development for a while, they have seen 40 percent to 60 percent drops in resale values, she said. Closer to home, she's had clients pull out of deals and refuse to consider areas that are possible sites for wind turbines.

"Even if people don't mind looking at it, they're not going to put their investment in an area where they're going to have turbines depreciate it," Ms. Miller said in a phone interview on Monday. "They don't want to look at them, see them, and others don't want to buy because they don't know what the wind turbines will do for property values."

National studies have gone both ways, some saying that wind turbines have no effect on property values and others saying the projects hurt property values.

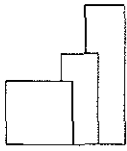
Data on the local real estate trends were compiled by Clifford J. Schneider, a Cape Vincent resident and former fisheries biologist with the state Department of Environmental Conservation.

The analysis compared Cape Vincent sales, closing prices and days on market to those in Alexandria Bay, Brownville, Clayton and Lyme from 2000 through 2009. The analysis included houses of more than 1,000 square feet on the Jefferson-Lewis Board of Realtors Multiple Listing Service.

Both overall residential sales and a subset of waterfront residential sales were analyzed.

Closings for the 2006-09 period declined 8.4 percent in the other four towns and 15.4 percent in Cape Vincent, though that was not statistically significant.

In waterfront properties over the last decade, closings fell 12 percent in Cape Vincent and 4.6 percent in the four-town average. In the more recent 2006-09 period, closings fell 10 percent per



year for the four-town average and 25 percent in Cape Vincent. The difference in the decline was statistically significant.

Cape Vincent had 10 residential property closings in 2009, three of which were waterfront.

"This should be a good wake-up call to people," Ms. Miller said.

Average days on market declined for the four towns by 9.5 percent per year through the decade. Through the decade, the trend was a drop by 7.3 percent per year in Cape Vincent, but in 2006-09 the days on market increased 58.5 percent per year, while the four-town average increased 10 percent.

"There is some evidence that the Cape Vincent housing market is in a slump, more so than what would normally be credited to the decline in the general economy," the report said.

The economy is playing some role in the decreased number of sales.

"Things are slow partly because the overall economy is so bad," said Brooks J. Bragdon, a real estate sales agent and Cape Vincent councilman. "But things are even slower in areas overdeveloped by wind turbines."

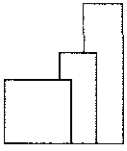
Some local wind farm opponents are pushing for a property value assurance agreement, in which a developer would pay the difference between a property's sale price and the value of comparable property outside of a wind power development if the property loses value.

The two real estate professionals said that won't be enough.

"I don't put too much stock into it because the aesthetics of the area are so valuable that you can't put a dollar figure onto it," Mr. Bragdon said. "We should address the setbacks and make them reasonable according to the zoning law and comprehensive plan and state and federal rules without getting into compensating people for lost value."

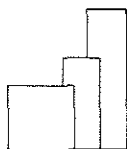
Ms. Miller agreed.

"It doesn't take care of the tourism economy," she said. "There's no way to solve that."



McCann Appraisal, LLC

Appendix E



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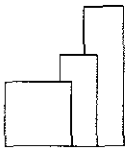
On ABC's Stateline, Lane Crockett of the wind industry said, "There is no evidence whatsoever in any peer-reviewed article or medical assessment that says there's any health effect from wind farms."

Worldwide, people are experiencing noise problems from wind farms, Nina Pierpont's research has been published with peer review, and the wind industry's story that people are not affected by noise from wind turbine noise is far from the truth.

The noise problem was experienced by residents near the Toora wind farm more than 4 years ago.



Early in 2007, Stanwell, Queensland Government, owners of the Toora wind farm, bought Les Osbourne's house which was about 600 metres or so from the nearest turbine and then bulldozed the house. Les was originally in favour of Stanwell building turbines all around him, believing the spin about there not being any noise problems. In fact he signed the petition in favour of the windfarm 5 times. Once the wind farm was built he started to suffer from the noise.

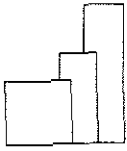


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The house, being demolished in the photos, is just across the road from Jayne & Steve's place who also suffered from the low frequency noise so much it affected their health and the company was required to institute temporary shutdowns of turbines.

And why is it the Brumby government does not want to use current noise standards and the wind industry is reacting so strongly against a national code for wind farm development?



Acoustic Ecology Institute

Wind Farm Noise: 2009 in Review

In the most extreme cases, families are forced to move from their homes to escape the effects of the ongoing noise disturbances. These are not necessarily people living extremely close to turbines; such unlivable situations have occurred from 1000 feet to over a half-mile from the closest turbines. Some wind farm developers have actually bought out neighbors that were especially impacted, though most are left to make the best they can with a piece of property that will be difficult, if not impossible, to sell. I have not seen any comprehensive listing of residents who had to move, but such reports are becoming more common in the US, Canada, and the UK, totaling perhaps three to six per year.

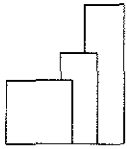
Oregon wind farm ruled too loud: six months to find fix

[Human impacts](#), [News](#), [Wind turbines](#) [No Comments](#) »

The Morrow County Planning Board ruled this week that the Willow Creek Energy Center, an 80-turbine wind farm, is producing noise levels that violate Oregon's noise limits, and gave Invenergy, the wind farm's owner, six months to get the turbines into compliance. The wind farm began operating in January 2009, and by March, several neighbors within a half mile had raised serious concerns about the noise ([see this article for details](#)), including regularly having difficulty sleeping. Noise monitoring then took place, and in January of this year, the Planning Board received the results, which showed that noise levels at four homes sometimes exceeded the limit of 37dB. There was some contention at that meeting, as neighbors had hired independent noise monitoring consultants, whose records showed more consistent violations than those of the Invenergy-hired consultant; the differences were pegged to the fact that the Invenergy consultant did not record in high wind speeds, contending that the noise gets no louder above wind speeds of 9m/s. It is unclear from initial news reports whether the wind farm will be required to comply with the noise limits based on the Invenergy sound monitoring protocol, which found excess noise just 10% of the time at one house, and less frequent slight violations at three others, or whether they'll use the more comprehensive techniques used by the local citizens, which found violations more consistently at two homes (one just over the limit, the other often over 40dB), with one home experiencing excess noise on 22 out of 37 nights.

Carla McLane, Planning Director for Morrow County, noted that while the commission did rule the wind farm was violating state regulations, it found the turbines only crossed the noise threshold at certain times of day and under certain conditions. "Some would want to view it in black and white and if it's a violation then you have to shut them down," McLane said. "Others would want to view it in terms of shade of gray and say it's not an ongoing and continuous violation. It's an intermittent violation."

"I'm not sure how someone can say this is an unusual, infrequent event," said Kerrie Standlee, one of the neighbors' noise consultants. "To me, 59 percent (of nights with excess noise) is not occasional or unusual." Standlee's noise study also went beyond Invenergy's in that he gave the residents a sheet of paper to log their experiences with time and date. He then overlaid those comments on the data and showed that when the residents reported high noise, the wind was blowing from a particular direction or at a particular speed. This last bit of information may offer Invenergy some direction about when they might shut down turbines if they want to avoid the worst of the noise issues, during the six months they have to get into compliance.



The Planning Board struggled with the conflicting approaches, according to the *East Oregonian* ([article archived here](#)). "I have a very hard time coming to a concrete conclusion on which study I feel is accurate," Commissioner Pamela Schmidt said. "I'm not a licensed engineer in acoustics myself and there's been so much information I can't make a decision." Invenergy claimed that the background ambient noise varies, so that in higher wind periods, it should be allowed to exceed 36dB; yet, in its permit, it used the 26dB ambient standard, which is the state's default if measurements are not made ahead of time. Complicating matters more is the fact that, as the *East Oregonian* noted, "the rule does not direct agencies on how to administer the rule or decide conflicts such as the one between Invenergy and its neighbors. The agency that originally enforced the rule, the Oregon Department of Environmental Quality, has since defunded and destaffed its noise program."

It's worth noting that the noise issues seem to be quite pronounced even at sound levels of 40dB. Oregon's 36dB limit is among the most conservative in the country; it's based on being 10dB above average night time ambient noise levels, which have been measured at 26dB. It appears that noise issues may well be present even when the measured sound levels are at or very near 36dB; this is in synch with reports from elsewhere, which suggest that people accustomed to quiet rural night time soundscapes are quite easily disturbed when turbine noise becomes one of the loudest local sounds, even when absolute noise levels are not extreme. In general, acousticians consider a sound to become readily audible when it is 5dB above ambient, with disturbance considered likely when it reaches 10dB above ambient.

26

Clifton Maine considers 4000 foot setbacks for wind turbines

Human impacts, News, Wind turbines No Comments »

A private landowner in Clifton, Maine, is hoping to erect four commercial wind turbines on a small ridge known as Pisgah Mountain, and sell the energy to the local utility, Bangor Hydro. Hearing of negative experiences in other Maine towns, including Mars Hill and Vinalhaven, some local residents are concerned about noise impacts and effects on wildlife. The town of Clifton has drafted a new ordinance that sets 4000 feet as the minimum distance between a turbine and a neighboring house; this ordinance will go before voters on June 8. In both other towns, affected families live within 3500 feet of the local turbines.

"What we have on this site is setbacks to the closest residence of a little over 4,300 feet," says Paul Fuller, who owns the 240 acres where the turbines would be built. "I think we could boast that that is the farthest setback of any wind farm in the state of Maine at this point." Several other homes are within a mile to mile and a half of the location.

If this project moves ahead, it would be one of the first to do so with regulatory setbacks of over 1500-1700 feet, which are commonly used in Maine and elsewhere in the US, as developers aim to reach a 45dB limit at homes.

The ordinance allows sound levels of up to 50dB during the day and 40dB at night; past experience would suggest that at this distance, these sound levels are unlikely to be reached, though it is entirely possible that the turbines will be somewhat audible up to a mile or so away at times (night time noise levels in rural areas can be as low as 20-25db). Some community advocates urge setbacks of a mile or mile and a quarter, to more surely eliminate



audible noise issues; this project would be a valuable “guinea pig” for the helping answer the crucial question of where the proper balance lies between wind development and respecting the rural soundscape of small towns.

[Read more and see a news clip at WLBZ2.com](#)

22

UK addresses challenges in assessing wind farm noise

[Human impacts.](#) [News.](#) [Wind turbines](#) [No Comments »](#)

England’s primary environmental agency, the Department for Environment, Food, and Rural Affairs (DEFRA), has commissioned a study to improve techniques for assessing wind farm noise. “There is a possibility that local authorities are not currently investigating complaints about noise from wind farms due to the absence of any formal technical guidance,” an internal document reads. “Defra wishes to let a contract to provide local authorities with a methodology by which to investigate noise from wind farms, to support local authority enforcement of statutory nuisance legislation.” [According to the Telegraph](#), the report is due out later this year, and should make it easier for local councils to respond to noise complaints. [A recent survey](#) suggests that about one in seven UK wind farms have spurred noise complaints; noise campaigners contend that many people who are bothered do not file formal complaints, since they are rarely acted upon.

Meanwhile, also in the UK, the [Bradford Planning Inspector upheld a ruling by the city Council to deny a permit](#) for building a single large turbine at a factory in town. The applicant had appealed the denial, since its noise studies showed that that the turbine would be in compliance with the federal noise code ETSU-R-97, which is the only code named in the statutes. However, the investigating Bradford Council Environmental Health officer used several other noise level methodologies when he visited a similar turbine in Norfolk. Using World Health Organisation and British Standard guidelines and codes of practice, as well as ETSU-R-97, he came to the conclusion that the Princes Soft Drinks turbine would cause a noise nuisance for nearby residents. The [Planning ruling noted](#) that even according to the company’s modeling, “for some dwellings under certain conditions, the emitted turbine noise is likely to lead to complaints. Furthermore, according to WHO standards, there would be times when this noise could result in sleep disturbance, or prove to be a serious annoyance to residents. I find this to be unacceptable.”

Councillor John Ruding said: “I am delighted that the inspector agreed with the local community and their voices have been heard. “These proposals were an experiment on people’s lives which was not acceptable.” Earlier, [at the time that the company appealed the initial denial](#), another Councillor, James Cairns, had noted, “The Council has done its best. Its officers didn’t believe it was feasible in the area. Bradford is not against wind turbines - if you go up onto the moors, you will see them. But turbines of this size have not been tried and tested in urban areas.”

14

Third of a mile setback doesn’t prevent wind turbine noise issues in Falmouth

[Human impacts.](#) [News.](#) [Wind turbines](#) [No Comments »](#)



When the town-owned wind turbine began operating at the Falmouth, MA wastewater treatment facility in March, most townspeople saw it as the most striking example of the town's far-reaching commitment to sustainability.

Since then, it's generated about a third of the town's electricity needs, and a second turbine is being readied for installation nearby this summer. As noted at a [forum on the town's many energy-savings initiatives](#), in discussing the second turbine: "The special thing about the site is it's remote. The nearest home is about 1/3 mile away, which is important in terms of noise and appearance." (This is just under 1800 feet, or 600 yards.)

But over the few weeks since the first turbine began operating, residents are finding the noise much more disruptive than they'd imagined. [According to the Cape Cod Times](#), some neighbors who live in the sparsely populated, wooded area around the treatment facility were horrified when they heard the noise. "It's destroyed our capacity to enjoy our homes," Kathy Elder said. Elder said the noise surrounds her residence, alternating between a jet's whine, thunder and a thumping that sometimes can be felt.

The town has received formal complaints from six residents, one of whom, Annie Hart Cool, has gathered over 40 names of people within a mile or so who say they are affected. She notes that her husband enjoys working in their yard after work, "but when he comes back inside and his head is hurting, you know something's wrong."

Assistant Town Manager Heather Harper says that the town has asked Vestas, the turbine manufacturer, to come check whether there are any mechanical issues that may be causing elevated noise levels, and is asking residents to compile records of when the sound is worst, to help the town figure out how to respond. "This has been a community project from the beginning," Harper said. "We're genuinely concerned and we take the complaints very seriously." At the same time, Harper noted that "We didn't expect no sound, but it should meet all governmental standards." This is, indeed, often the issue: governmental noise standards, which tend to range from 40-50dB, are not always sufficient to avoid negative impacts on the nearest neighbors.

UPDATE: [Another local newspaper covers the brewing controversy.](#)

03

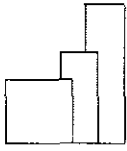
South Dakota residents fail to get half-mile wind farm setbacks

[Human impacts. News. Wind turbines 1 Comment »](#)

An excellent [3-part series on wind farm development](#) ran [this week](#) in the Bismark Tribune. It has a good balance of the excitement and economic benefits that attract farmers to the industry, and well-stated concerns from those who want larger setbacks in order to protect neighbors from noise. The grey area around health impacts is navigated quite well, with a well-grounded emphasis on sleep disruption; and most strikingly, the piece includes acknowledgement that there is individual variability in how easily people can adapt to a new and potentially intrusive noise source.

Interestingly, there are repeated indications that in this community, as in others, a half mile setback was seen as the "sweet spot" that could accommodate both industry and neighbors; in initial community meetings, there was significant support for a one-mile setback, while a general consensus emerged that a half mile would be tolerable to most people. Nonetheless, the county decided to go with a third of a mile (1750-foot) setback, which has some community members concerned that the turbines will be audible enough to be disruptive at times.

25



Maine towns keep wind farms at arm's length as state looks to far offshore sites

[Human impacts](#), [News](#), [Ocean](#), [Wind turbines](#) [No Comments](#) »

"As goes Maine, so goes the Nation?" While this old political truism has faded in recent decades, the State of Maine is currently blazing trails in carefully considered wind power development. At the local level, small towns continue to pass moratoriums and strict setback standards. Most recently, Thorndike became the third town to set a one-mile setback, with the neighboring town of Dixmont taking up a similar ordinance at this week's town meeting. Meanwhile, two more towns, Avon and New Vineyard, joined four others who have hit the pause button on any wind farm developments by adopting moratoriums on any permits. These actions come in the wake of three projects that have generated significant noise issues for neighbors out to as far as 3000-3500 feet; thus, half-mile setbacks are being seen as not enough to avoid risk of disrupting rural lifestyles.

While these towns see the state as being overly aggressive in supporting ridgetop wind farms (abetted by the fact that a former Governor is one of the state's leading wind developers), when it comes to offshore wind development, the state's goals will be much more welcome for most coastal communities. Instead of opening Maine state waters to windfarm leasing, the legislature's Committee on Utilities and Energy is redrafting controversial ocean windfarm bill LD 1810 to do the very opposite. Under changes to be finalized today at the committee's 2nd worksession on the bill, "An Act To Implement the Recommendations of the Governor's Ocean Energy Task Force" will focus Maine instead on constructing floating deepwater windmills on land, and then deploying them at locations ten miles offshore and further, where wind speeds are higher and more consistent and fisheries are less impacted.

The plan received an enthusiastic response from the Maine Lobstermen's Association, which has been very concerned about the impacts of any traditional bottom-mounted wind turbines on their activities near shore.

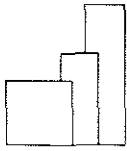
Habib Dagher, who leads the University of Maine's offshore wind project, offered a timeline for getting deepwater wind energy going off Maine. "Our goal is build our first demonstration floating turbine - a third-scale turbine about 120 feet above the water - next year, and place it in the water the year after in the Monhegan site," Dagher said. "In 2013 we would build the first 4 or 5 megawatt unit, In 2014 and 2015, a 25 megawatt farm." He predicted that offshore wind would keep growing: "The next phase is development of a large scale 500 to 1,000 megawatt farm. We have at least one developer interested to do that and have it operational in 2020"

22

UK: Noise complaints at 37 of 255 wind farms

[Human impacts](#), [News](#), [Wind turbines](#) [1 Comment](#) »

Here's a bit of news that might be spun either way, depending on your predilection. Jane Davis, who was driven from her home by wind farm noise, has been compiling information on English wind farms and noise complaints; she has found that 37 wind farms have spurred some sort of noise complaints nationwide. This amounts to about 1 in 7 UK wind farms, in contrast to an oft-repeated mantra that "only four" UK wind farms had noise issues, and they'd been "resolved." The new numbers could support those cautioning that wind farm noise issues are more widespread than generally acknowledged, AND those who claim that noise issues are the exception rather than the



rule; it certainly reinforces AEI's theme that we need to acknowledge that a minority of people are affected by noise around wind farms, and that we must come to grips with how to address this.

This article in the Telegraph details some of the information shared at a gathering of wind farm noise campaigners, WindCon2010. Gillian Haythornthwaite, who lives near the wind farm in Askam with her partner Barry Moon, said it has been a "devastating" experience. "It is a dreadfully irritating whoosh, whoosh noise," she said. "It is unbearable to be outside in the garden when there is the noise."

[Read the rest of this entry »](#)

23

Ontario wind tech and health research chair named-background is solid in tech, weak on health

Health, Wind turbines No Comments »

Electrical engineer Siva Sivoththaman has been named to the newly-created Ontario provincial Research Chair in Renewable Energy Technologies and Health. Local activist groups that have raised concerns about the effects of wind farm noise on neighbors had hoped that this position, created as part of Ontario's new Green Energy Act, would take the lead in formally investigating the negative health effects some neighbors of wind farms have reported. However, the choice appears to be more oriented toward the technology aspect of the Chair's responsibilities. As noted in the request for proposals: "The Chair in Renewable Energy Technologies and Health will focus first on emerging science and technology related to wind turbines, and then will explore the potential health effects from renewable energy."

According to a news release, "Dr. Sivoththaman will bring focus to multi-disciplinary activities in renewable energy technologies and health, ensuring that health and safety are top priorities in the induction of new technologies. His research program will develop new technical approaches and will provide guidelines in setting standards to ensure health and safety in the manufacturing, use, and end-of-life phases of renewable energy technologies." Sivoththaman's research centres on silicon-based crystalline and thin-film photovoltaic devices, and he serves as director of the Centre for Photovoltaic Systems and Devices, which occupies much of the photovoltaic research building beside Matthews Hall. His interest extends to nanocrystalline semiconductors, and he was the first director of the University of Waterloo's nanotechnology engineering program when it was launched in 2004. Two leading Ontario wind activist groups expressed their disappointment with the choice; Wind Concerns Ontario said "We have no faith in any meaningful body of evidence being produced on health effects from wind turbines by this government-funded non expert and Ontarians will suffer for it," while the Society for Wind Vigilance chair Dr. Robert McMurtry said the choice missed the mark in that "the lead and expertise of this Research Chair would more appropriately have been a clinician scientist. We strongly encourage the new Chair to seek the appropriate collaborators as the research program is established."

It is as yet unclear what the Chair's timeline will be in addressing the dual (and quite distinct) topics he is charged with overseeing. Given the widespread concern about health effects, and the role this concern is playing in the wind development process in Ontario and elsewhere, we hope that the two topics will be pursued simultaneously. And indeed, as McMurtry suggests, it is clear that the Chair will need to bring in some experts in health and



acoustics to effectively address the health aspects; in the spirit of collaboration and inclusiveness, we can also hope that his research/investigative team draws from qualified experts who have expressed concerns about wind noise, as well as those who have previously worked on reports that found few health effects.

11

Vinalhaven begins month-long “experiment” in reducing noise issues

Human impacts. News. Wind turbines 4 Comments »

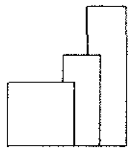
The Fox Islands Electrical Cooperative on Vinalhaven, an island off the coast of Maine, has begun a month-long experiment as a first step in trying to come up with a local solution to noise issues from three wind turbines that began operating in November. About two dozen people within a half-mile of the turbines have reported annoying levels of noise, with six property owners claiming that their lives are severely impacted. Others in the same area who can hear the turbines are not particularly bothered by the noise.

Shortly after the turbines started operating, and some residents (including some who were excited about the wind farm, and some who had been skeptical) reported unexpected noise issues, neighbors began noting the times that the sound was most troublesome, in an effort to identify what wind directions or atmospheric conditions might be most to blame. At its January meeting the Board of the electric coop decided to conduct a month-long “experiment” during February, in which the turbines would be slowed down in random patterns. Sound measurements will be made throughout the month, and the 38 households within a half-mile are being asked to log their sense of the noise on a regular basis (half these households are summer people, so are unlikely to be participating). In a letter to coop members, the board said the experiment “will enable us, as a community, to figure out what to do and come to a solution that works, as well as possible, for everyone.”

A very detailed article in The Working Waterfront, a local paper, features a variety of comments from a locals about the process that is underway to find a community-based solution to the noise problems. Some find that the noise is moderate enough to be tolerable, easily drowned out by other sounds such as the TV or a car passing by, or being no more bothersome than a dishwasher running in another room; one person remembers the noisy generator that used to provide power to the town in the 60s and 70s, which people got used to. Some who have been disturbed share their perceptions, as well; Ethan Hall notes that “I’ve never heard anything in my life that sounds like it.” Both he and Lindgren (another neighbor being affected) believe that current sound measurement standards do not take into account the complexity of turbine noise and its true impact. “The nature of the sound is so unique, that to try and quantify or qualify it with a strict dBA [decibel] measurement is an entirely inadequate way of describing the effect on people and surroundings,” Hall feels. An hour-long radio interview with Hall and others being affected, recorded this past December, is available on the WERU website.

The Acoustic Ecology Institute

May 31, 2010



Lawsuits begin to crop up, challenging nearby wind farms

In recent months, several lawsuits and formal complaints have been filed, claiming unlawful nuisance and/or impacts on property values and quality of life near wind farms. Most recently, sixteen residents sued the Michigan Wind I wind farm and its developers, laying out a series of complaints, including (as [detailed in the Huron Daily Tribune](#)):

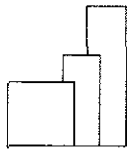
- Private nuisance from, among other things, sustained and highly annoying audible noise and amplitude modulation in both audible and sub-audible frequencies
- Negligent design of a wind farm, including a noise assessment that estimated only audible noise levels within the dBA range, and did not consider low frequency noise or impulse noise
- Negligent misrepresentation, claiming the wind companies made false representations in board of commissioner and planning commissioner meetings and public hearings when company representatives said the wind farm's operations would not result in a noise nuisance or cause adverse health effects to adjacent landowners. "(The defendants) were negligent in making these misrepresentations because, as the parties seeking approval to construct a wind turbine farm in Huron County, they had a duty to use reasonable care to provide Huron County and its citizens with both accurate and complete information," the lawsuit states. The plaintiffs claim the wind companies provided inaccurate and/or incomplete information about the audible turbine noise levels, and no information about low frequency noise, infrasound and/or impulse noise emitted from the turbines.

In Pennsylvania, the Allegheny Ridge Wind Farm [settled out of court this week](#) as a lawsuit brought by Todd and Jill Stull was moving toward a jury trial in July. The suit alleged that the company misrepresented the noise levels that would be generated by assuring residents the noise would be minimal. The agreement is bound by confidentiality, so no details are available. See [earlier coverage of the lawsuit here](#).

Meanwhile, in neighboring Wisconsin, a family that abandoned their home near the Forward Energy Wind Center, is assessing their options after the state Public Service Commission dismissed a complaint they filed, seeking compensation from the wind developer for business losses from their alpaca farm, health impacts and property value losses. The PSC determined that they did not have jurisdiction to consider the complaint, and recommended the family seek relief in circuit court. [Read more on this in the Milwaukee Daily Reporter](#).

In Maine, neighbors of the Mars Hill wind farm [filed suit in August](#), seeking compensation for what they say is a resulting drop in their property values along with emotional and physical distress.

In 2006, residents near a Texas wind farm were [rebuffed by courts in their region](#), which ruled that [noise issues were aesthetic claims](#), and did not qualify for relief under nuisance laws. There, turbine noise averaged 28 dBA at



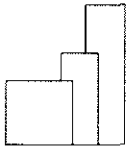
McCann Appraisal, LLC

a distance of 1.7 miles from the wind turbines, and 44 dBA at 1,700 feet; it's worth noting that night time ambient sound levels are likely between 20 and 30dB in this ranch land.

Across the pond, a court in France responded to a noise complaint by ordering 8 wind turbines shut down from 10pm to 7am.

And, while not a court challenge, residents in Massachusetts have asked the state public health commissioner to assess the health and well-being effects of living near wind farms. Since a single turbine began operating in Falmouth, over forty nearby residents have struggled with noise issues; one, an air traffic controller, is concerned that sleep disruptions he's experiencing will affect his job performance.

<http://aeinews.org/archives/926>



McCann Appraisal, LLC

Interview with Ann and Jason Wirtz
N1157 Hwy YY
Oakfield, WI 53065
902 960 5246
Dodge County, Wisconsin
Conducted on the evening of May 2, 2009 by Lynda Barry

WIND TURBINE NOISE FORCES WISCONSIN FAMILY TO ABANDON HOME

TOWN OF OAKFIELD- While lawmakers in Madison consider a bill which will override local government and give the Public Service Commission of Wisconsin siting authority for wind farms throughout the state, one Dodge County family already living in a wind farm approved by the PSC has decided to abandon their home due to turbine noise.

Ann and Jason Wirtz have a pretty Wisconsin farmhouse near the Town of Oakfield. It's the kind of place that had people stopping by to ask if the family would consider selling it.

"They'd just pull into our driveway," says Ann. "There were people who said if we ever decided to sell it, we should call them."

Although turn-of-the-century house needed a lot of work when they bought it, they didn't mind. The Wirtz family planned to stay. They both grew up in the area and wanted to raise their children there.

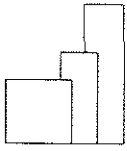
"I thought we were going to live here for the rest of our lives," says Ann, a mother of four. "I thought one of our kids was going to live here after us."

This was before 86 industrial wind turbines went up around their home as part of the Forward Energy wind project which began operation in March of 2008. The closest turbine is to the Wirtz home is less than 1300 feet from their door.

"Last night it was whining," said Ann. "It wasn't just the whoosh whoosh whoosh or the roaring. It was a high pitched whine. And I don't just hear them, I can feel them." She describes a feeling like a beat in her head, a pulse that matches the turbine's rhythm.

"Last night was really bad," she said.

She says she knows which nights are going to be loud by which way the turbine blades are facing, and her family dreads the nights when the wind is out of the west. "That's when they are the loudest."



Jason said he found out there was a wind farm planned for his area from a neighbor he ran into at the post office. "He asked me if I knew anything about the turbines coming in. I didn't." Jason came home and mentioned it to Ann.

"When I first heard about it I wasn't that alarmed," says Ann, "People were saying how bad they could be, but I just didn't believe them at first."

She assumed the turbines would be sited much further away from her home, unaware of the controversy over the setbacks approved by the Public Service Commission of Wisconsin which allows turbines to be sited close as 1000 feet to the homes of people like the Wirtzes.

"All those orange flags they put in were way back there. I was thinking it wouldn't be too bad. And then when that access road started coming in so close I said, 'what the heck is going on?'

Meanwhile, Jason had been attending town meetings and learning more about the project. The more he learned, the more worried he became. Five months before the turbines went up, the Wirtz family decided to sell their house.

They called people who had let them know they'd be interested in buying it. "When they found out about the turbines," said Ann, "They weren't interested anymore."

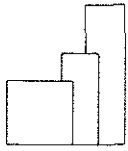
Wirtz family prepared the house to put on the market. In November of 2007, the home, sitting on eight acres, was appraised for \$320,000. But this once sought-after property could find no buyers. "As soon as people found out about the wind farm coming in," says Ann. "That was it. And once they started building the roads to the turbines, forget it. They'd ask what that road was for, we'd tell them and we'd never hear from them again."

After the turbines went up, interested buyers stopped showing up altogether.

"We tried to find another realtor," said Ann, "They'd ask 'is it near the wind turbines?' and when they found out it was, they wouldn't even bother to come out to the house to look at it. One realtor told me it wasn't worth her marketing dollars to even list it because if it was in the wind farm she knew she couldn't sell it. I mean have you ever heard of a real estate agent turning down a chance to sell a house?"

Another realtor said they would have to price it well under \$200,000 to get anyone to even look at it. "At that price we were going to be \$50,000 worse than when we started," said Ann. "And that didn't include the 12 years of work we put into the place."

But the Wirtzes were increasingly anxious to get away from the turbines. While Jason, who works nights, wasn't having much trouble with the turbine noise, it was keeping Ann and her children from sleeping well at night. They were tired all the time. They were also getting frequent headaches.



And there was trouble with their animals as well. The Wirtz family raise alpaca and have a breeding herd. Ann says the Alpaca became jumpy the first day the turbines went on line. "Normally they are so calm. But the day the towers started up, they seemed to panic. They were on their back legs right away."

Ann says the herd had always been docile and healthy, with no breeding problems. Since the wind farm started up, their temperament has changed and none of the females have been able to carry a pregnancy to full term. "They're nervous all the time now. I can't prove anything but I do know my animals. And I really felt something was wrong. All the years we've had them we've never had a problem."

At night herd shelters in the large metal shed behind the Wirtz home. When the turbines are loud, Ann says the sound echoes inside the shed and the metal vibrates and hums. "The noise in here gets just unbelievable. When the tin starts to vibrate in here, they can't stand it. I have to find them a better home. This is torture for them."

The same turbine noise has driven Ann out of her own bedroom "I can't stand to be in that room anymore. I don't sleep at all. My sleep has been terrible." Instead she sleeps on the couch where a fan on their pellet stove helps counter the turbine noise. "My number one complaint is how tired I am all the time," says Ann, "I never had that before, ever."

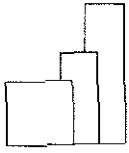
Says Jason, "We don't have air conditioning, we didn't want it and we didn't need it. In the summer we just opened the windows and let cross breezes cool the house. But the first summer with the turbine noise we had to shut the windows and turn on the fan. We couldn't stand it."

After one of the children was recently diagnosed with a severe stress-related illness, the Wirtzes decided they'd had enough. They decided the health of their family was more important than keeping their home, and they are abandoning it.

"Now, after all the trouble we've had living here" said Ann, "If a family showed up and wanted to buy the place and they had kids, I don't think I could sell it to them. Knowing what I know about living here, I just don't think I could put another family through this."

They are now looking for a place in a nearby village. "We were born and raised in the country but we're thinking of moving to Oakfield because they aren't going to plop a 400 foot turbine in the middle of the village, says Jason. "And I know I'm going to have to drive by this place every day on my way to work. It's going to make me sick to see it, but I can't stay here anymore."

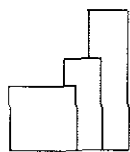
Ann adds, "I say we move near whoever it is that decides on the setbacks because you know they'll never have a turbine by their place"



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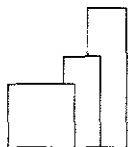
Jason and Ann sit at the dining room table and point out the elaborate woodwork they'd stripped and re-finished by hand. Jason holds a picture of the farmhouse from happier times. Earlier that day they'd met with the people at the bank to let them know they were giving up their home.

Jason says, "At least we're young enough to start over. My mom, she doesn't have much money and now she has turbines around her house. She said, 'This house was my retirement,' Her and my dad put everything into that house. Now I don't know what she's going to do." Jason says, " The quality of life we had here is just gone. I grew up here and I loved it here. But I don't anymore. "



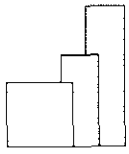
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Appendix F



Representative Sample of Neighbor Complaints

Name	State	Project	MW	Turbine Setback	Notes
Rene Taylor	IL	Twin Grove	396	1500	sued over substation near home; suit dropped but can be brought again
David & Stephanie Huithen	IL	Illinois Wind		1500	complained
Patty Spalding	MA	Newburyport			complained; worked to get ordinance changed
Sharon Eddy	MA	Falmouth			complained
Todd Family	ME	Mars Hill	42	2500	sued town and company
Carol Cowperthwaith	ME	Mars Hill	42	2500	sued town and company
Phil Bloomstein	ME	Freedom		1000	no action
Ethan Hall	ME	Vinalhaven		2500	threatening suit. Wind company claims they are trying to fix the problem
David and Sally Wylie	ME	Vinalhaven		2500	threatening suit. Wind company claims they are trying to fix the problem
Art and Cheryl Lindgren	ME	Vinalhaven	42	2500	threatening suit. Wind company claims they are trying to fix the problem
Fletcher Family	ME	Mars Hill	42	2500	sued town and company
Boyd Family	ME	Mars Hill	42	2500	sued town and company
Harris Family	ME	Mars Hill	42	2500	sued town and company
Birtchell Family	ME	Mars Hill	42	2500	sued town and company
Gene Champagne	MI	Harvest Wind Farm			registered complaint
Charlie Porter	MO				sued wind company; case dropped
Daniel & Carolyn d'Entremont	Nova Scotia	Pubnico Point		1000	abandoned home
Tim Yancey	NY	Maple Ridge			filed complaints
Jessica	NY	Sheldon Wind			no action
Jim and Judi Hall	NY	Cohocton Wind			filed complaints
Hal Graham	NY	Cohocton Wind		1000	has turbine on land; came out against wind company
Colette McLean	Ont			1000	developer purchased her home
Barbara Ashbee-Lormand	Ont.			1000	abandoned home
Dale Rankin	TX	Horse Hollow			sued but lost in court
John Ruggiero	TX	Barton Chapel		2500	complained to county
Tom Shea	VT	Searburg		1000	complained; asked for property value reduction
Larry Wausch	WI			1500	complained
Gerry Meyer	WI	Forward Wind		1100	complained
Ann and Jason Wirtz	WI	Forward Wind		1000	abandoned home; filed suit
Tony S. Moyer	WI	Cedar Ridge		1320	complained
Barbara Apter	IL	Rail Splitter		1500	sued; settled, sold at reduced price. Horizon wind guaranteed property value
Todd and Jill Stiles	PA	Alegheny Ridge		2000	sued over noise, case accepted in court and pending



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Why did the people who once lived in this house have to abandon it?



The home in the photo above was made uninhabitable by wind turbine noise and vibration. The family who once lived here were forced to abandon their home in 2006. Three years later, it remains empty and unsold. [To read more about this story,](http://www.windaction.org/news/3003)
<http://www.windaction.org/news/3003>

Wind Turbine Syndrome: A Report on a Natural Experiment

Nina Pierpont, MD, PhD

Executive Summary

12/20/2009

The core of the book is a scientific report presenting original, primary research on symptomatic people living near large industrial wind turbines (1.5-3 MW) erected since 2004.

These are the findings:

- 1) Wind turbines cause Wind Turbine Syndrome. We know this because people have symptoms when they are close to turbines and the symptoms go away when they are away from turbines. The study families themselves figured out that they had to move away from turbines to be rid of their symptoms, and nine out of ten have moved. Some sold and some abandoned their homes.
- 2) People do not abandon their homes out of “annoyance.” Reported symptoms, such as sleep deprivation, dizziness, and nausea, cannot be dismissed as “annoyances.”
- 3) The symptom cluster is consistent from person to person, hence the term “syndrome.”
- 4) The symptoms are sleep disturbance and deprivation, headache, tinnitus (ringing in ears), ear pressure, dizziness, vertigo (spinning dizziness), nausea, visual blurring, tachycardia (fast heart rate), irritability, problems with concentration and memory, and panic episodes associated with sensations of movement or quivering inside the body that arise while awake or asleep.
- 5) Children are affected as well as adults, especially older adults.
- 6) People with pre-existing migraine disorder, motion sensitivity, or damage to inner ear structures (such as hearing loss from industrial noise exposure) are more susceptible than other people to Wind Turbine Syndrome. These results are statistically significant ($p < 0.01$).
- 7) Wind Turbine Syndrome symptoms are not statistically associated with pre-existing anxiety or other mental health disorders.
- 8) The sample size of 10 families/38 people was large enough for statistical significance with regard to susceptibility or risk factors.
- 9) The susceptibility factors are clues to the pathophysiology of Wind Turbine Syndrome. The symptom complex resembles syndromes caused by vestibular (inner ear balance organ)

dysfunction. The proposed mechanism is disturbance to balance and position sense by noise and/or vibration, especially low frequency components of the noise and vibration.

- 10) An extensive review of recent medical literature reveals how balance-related neural signals affect a variety of brain areas and functions, including spatial awareness, spatial memory, spatial problem-solving, fear, anxiety, autonomic functions (like nausea and heart rate), and aversive learning. These known neural relationships provide a robust anatomic and physiologic framework for Wind Turbine Syndrome.
- 11) Medical and technical literature on the resonance of sound or vibration within body cavities (chest, skull, eyes, throat, ears) is reviewed, since study subjects experience these effects.
- 12) Published studies of documented low frequency noise exposure (both experimental and environmental) are reviewed. These demonstrate effects on people similar or identical to Wind Turbine Syndrome. Indeed, one study from Germany in 1996 may indeed be Wind Turbine Syndrome.
- 13) Recent mail-in survey studies of people who live near wind turbines in Sweden and the Netherlands are reviewed. These show that people are severely annoyed at noise from wind turbines at much lower A-weighted noise levels than for traffic, train, or aircraft noise.
- 14) Published literature documenting the effects of environmental noise on cardiovascular health and children's learning are reviewed. For health reasons, the World Health Organization recommends lower thresholds for nighttime noise than are currently observed in most countries —especially when the noise has low-frequency components.
- 15) Wind Turbine Syndrome gives a name and medical description to a set of symptoms severe enough to drive people from their homes and establishes medical risk factors for such symptoms. This study and other studies reviewed in the report indicate that safe setbacks will be at least 2 km (1.24 miles) and even longer for larger turbines and in more varied topography. Further research is needed to clarify physical causes and physiologic mechanisms, explore other health effects of living near wind turbines, determine how many people are affected, and investigate effects in special populations, including children. Government funding and moratoria are appropriate.

The book further includes:

- A) Full case histories—the words and experiences of all the study subjects (including children), presented in an organized tabular format.
- B) The report presented again in non-scientific, layman's language, explaining the medical, technical, and statistical aspects of the study. This section is illustrated.
- C) Peer reviews and commentary by scientists and university physicians.
- D) Introduction, complete list of scientific and medical references, glossary, and list of abbreviations.

Values in the Wind: A Hedonic Analysis of Wind Power Facilities*

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July 16, 2011

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ABSTRACT: The siting of wind facilities is extremely controversial. This paper uses data on 11,331 property transactions over 9 years in Northern New York to explore the effects of new wind facilities on property values. We use a fixed effects framework to control for omitted variables and endogeneity biases. We find that nearby wind facilities significantly reduce property values in two of the three counties studied. These results indicate that existing compensation to local homeowners/communities may not be sufficient to prevent a loss of property values.

1 Introduction

Increased focus on the impending effects of climate change has resulted in pressure to develop additional renewable power supplies, including solar, wind, geothermal, and other sources. While renewable power provides several environmental advantages to traditional fossil fuel supplies, there remain significant obstacles to large-scale development of these resources. First, most renewable energy sources are not yet cost competitive with traditional sources. Second, many potential renewable sources are located in areas with limited transmission capacity, so that, in addition to the costs of individual projects, large-scale development would also require major infrastructure investments. Finally, renewable power projects are often subject to local resistance.

Wind power is, by far, the fastest growing energy source for electricity generation in the United States, capacity and net generation having increased by more than 1,348% and 1,164%, respectively, between 2000 and 2009. No other sources of electricity have even doubled in capacity over that period. This sort of growth for wind energy is expected to continue into the future, although not at quite those high rates.¹ If additional steps are taken to combat global climate change, the demand for wind energy would only increase relative to these forecasts.

There are many outspoken critics who focus on the potential negative impacts of wind projects. These critics point to the endangerment of wildlife including bats, migratory birds, and even terrestrial mammals. Some critics also point to detrimental human health effects including abnormal heartbeat, insomnia, headaches, tinnitus, nausea, visual blurring, and panic attacks.² There are also concerns about the aesthetics of these facilities. One oft-quoted critic, Hans-Joachim Mengel a Professor of Political Science at the Free University, Berlin, has likened Wind Turbines to “the worst desecration of our countryside since it was laid waste in the 30 Years War nearly

400 years ago.”³ If wind turbines are perceived to have this manner of impact on local areas, they would have a strong negative impact on local property values.

As regards the noise impacts of these facilities, consider that estimated sound levels for a typical turbine at a distance of 1500 ft. are 50 dBA, equivalent to a normal indoor home sound level (Colby et al., 2009). Typically, distances between wind turbines and receptors are regulated at the local level. The New York State Energy Research and Development Authority (NYSERDA) recommends turbine setbacks of 1000 ft. from the nearest residence (Daniels, 2005). These setbacks focus on general safety considerations such as turbine collapse instead of specific health impacts associated with noise or vibration. The National Environmental Protection Act and comparable New York State Environmental Quality Review legislation prescribe a general assessment process that does not define specific turbine setback requirements. Viewshed impacts are more far reaching but vary widely by property and *depend on land cover and property elevations.*

As a result of these potential effects, the siting of wind facilities is extremely controversial, and debate about siting has caused delays and cancellations for some proposed installations. Perhaps the most famous case is that of Cape Wind in Massachusetts. First proposed in 2001, this project, approved by the U.S. Department of Interior in April 2010, calls for the construction of 130 turbines, each with a maximum blade height of 440 ft., approximately 5 miles off the shore of Cape Cod between Cape Cod and Nantucket. In response, local activists have organized the “Alliance to Protect Nantucket Sound” to fight the proposal through the courts and other avenues. This is despite the fact that the primary local impact is expected to be the impacted view from waterfront properties.⁴ In the case of terrestrial projects, the opposition can be even stronger. In Cape Vincent, NY, in Jefferson County, wind developers have been working since 2006 to construct two separate facilities that include 147 turbines.

Cape Vincent is bordered to the north by the St. Lawrence River and Lake Ontario, within view of an eighty-six turbine wind farm on Wolf Island in Ontario, Canada, and within a short drive to the largest wind farm in New York State. The response to the proposal has been spirited with both pro- and anti-wind factions fighting to determine its fate. In October of 2010, a lawsuit was filed to nullify a town planning board's approval of a final environmental impact statement: the meeting at which it was approved had been disrupted by vocal protestors.⁵ Recent reports in the popular media suggest that such controversy over wind turbines is widespread.⁶

At the individual level, property owners willing to permit the construction of turbines or transmission facilities on their property receive direct payments from the developer as negotiated through easement agreements. In terms of community benefits, wind developers claim that their projects create jobs and increase tax revenues by way of payment in lieu of taxes (PILOT) programs. PILOTs are a significant revenue source that can help offset overall town and school tax rates for all residents. These host community benefits are not unlike those made to communities that have permitted the construction of landfills within their municipal boundaries. In the case of Cape Vincent, a town appointed committee evaluated the economic impacts of the proposed facility and concluded that 3.9% of property owners would benefit directly from easement payments made by the developers.⁷ Easement payments are negotiated with individual land owners and are not publically available so the magnitude and actual economic benefit to these property owners was not quantified. PILOT agreements between the developers and the Town were estimated at \$8,000 per turbine or \$1.17 million per year. In the opinion of some Cape Vincent property owners, local officials are negotiating PILOT agreements to the benefit of the municipality, individual property owners are negotiating individual easement agreements to offset their respective property impacts, and property owners in close proximity to turbines

are left with no market leverage to offset the impacts that they believe turbines will have on their property values. This is the externality problem that is at the heart of the issue.

In moving forward with wind power development then, it is important to understand the costs that such development might impose. Unlike traditional energy sources, where external/environmental costs are spread over a large geographic area through the transport of pollutants, the costs of wind development are largely, but not exclusively, borne by local residents. Only local residents are likely to be negatively affected by any health impacts, and are the people who would be most impacted by aesthetic damages, either visual or audible. These impacts are likely to be capitalized into property values and, as a consequence, property values are likely to be a reasonable measuring stick of the imposed external costs of wind development.

The literature that attempts to measure these costs is surprisingly thin. To our knowledge, there are only two peer-reviewed hedonic analyses that examine the impact of wind power facilities on property values. Sims et al. (2008) and Sims et al. (2007) use small samples of homes near relatively small wind facilities near Cornwall, UK and find no significant effect of turbines on property values. The first of these studies has very limited data on homes, just home ‘type’ and price, and uses a cross-sectional approach. In addition, there is a quarry adjacent to the wind turbines, and other covarying property attributes which makes identification of the wind turbine effect very difficult. They actually do find a significant negative effect from proximity to the turbines but based on conversations with selling agents, attribute this instead to the condition and type of the homes. The second study uses a very small sample of only 201 homes all within the same subdivision and a cross-sectional approach. They focus specifically on whether homes can view the turbines and have very limited data on home attributes. Moreover, given the small geographic scope of the analysis, it is

unlikely that there was sufficient variation in the sample to identify any effect; all of the homes were within 1 mile of the turbines.

In 2003, Sterzinger et al. released a report through the Renewable Energy Policy Project (REPP) which used a series of 10 case studies to compare price trends between turbine viewsheds and comparable nearby regions and found, in general, that turbines did not appear to be harming property values. This analysis, however, was not a true hedonic analysis. Instead, for each project they identified treated property transactions as being within a 5 mile radius of the home and a group of comparable control transactions outside of that range. They then calculated monthly average prices, regressed these average prices on time to establish trends and then compared these trends between treatment and control groups. They did not control for individual home characteristics or any other coincident factors.

Hoen (2006) also focuses on the view of wind turbines, and collects data for homes within 5 miles of turbines in Madison County, NY. His sample is also small, 280 transactions spread over 9.5 years, and he uses a cross-sectional approach. He fails to find a significant impact from homes being within viewing range of the turbines. Hoen et. al (2009) use a larger sample of 7,500 homes spread over 24 different regions across the country from Washington to Texas to New York that contain wind facilities and again find no significant effect. They look at transactions within 10 miles of wind facilities and use a variety of approaches, including repeat sales. However, they limit themselves to discontinuous measures of proximity based on having turbines within 1 mile, between 1 and 5 miles, or outside of 5 miles, or a similar set of measures of the impact on scenic view, and they again find no adverse impacts from wind turbines. In addition, by including so many disparate regions within one sample they may be missing effects that would be significant in one region or another.

There is also a small literature using stated preference approaches to value wind

turbine disamenities. Groothuis, Groothuis, and Whitehead (2008) asked survey respondents about the impact of locating wind turbines on Western North Carolina ridgetops and found that on average households are willing-to-accept annual compensation of \$23 to allow for wind turbines, although retirees moving into the area require greater compensation. Similarly, Krueger, Parsons, and Firestone (2011) surveyed Delaware residents about offshore wind turbines and find that residents would be harmed by between \$0 and \$80 annually depending on where the turbines are located and whether the resident lives on the shore or inland.

This paper improves upon this literature using data on 11,331 arms-length residential and agricultural property transactions between 2000 and 2009 in Clinton, Franklin, and Lewis Counties in Northern New York to explore the effects of relatively new wind facilities. We use fixed effects analysis to control for the omitted variables and endogeneity biases common in hedonic analyses, including the previous literature on the impacts of wind turbines. We find that nearby wind facilities significantly reduce property values in two of the three counties we study. We find evidence of endogeneity bias in the use of fixed effects models with relatively large geographic groupings (census block-groups or census blocks) that appears to be controlled for in a repeat sales approach.

Section 2 provides background information on wind development and on the study area. Section 3 provides detailed information on our data and empirical approach. Section 4 provides the analytical results. Section 5 discusses the implications of our results and Section 6 concludes.

2 Background and Study Area

New York State is a leader in wind power development. In 1999, New York had 0 MW of installed wind capacity, but by 2009 had 14 existing facilities with a combined capacity of nearly 1300 MW, ranking it in the top 10 of states in terms of installed capacity.⁸ New York also appears to have more potential for terrestrial wind development than any other state on the east coast.⁹ This is borne out by the fact that there are an additional 28 wind projects in various stages of proposal/approval/installation in the state.¹⁰

New York has also been badly affected by the environmental impacts of traditional energy sources. The Adirondack Park, in particular, has been severely impacted by acid deposition and methyl mercury pollution (Banzhaf et al., 2006). In that sense, the state has much to gain from transitioning away from fossil sources of energy and towards renewable sources like wind. New York, however, has relatively little potential to develop solar, geothermal, or other renewable sources. Existing wind developments are spread throughout the state, with clusters in the far west, the far north, and in the northern finger lakes region. The largest projects, however, are in what is often referred to as ‘The North Country,’ and are in the three counties - Clinton, Franklin and Lewis Counties - which make up our study area, shown in Figure 1, together with the outline of the Adirondack Park and the location of the wind turbines in this area.

Northern New York is dominated by the presence of the Adirondack Park. The Adirondack Park was established in 1892 by the State of New York to protect valuable natural resources. Containing 6.1 million acres, 30,000 miles of rivers and streams, and over 3,000 lakes, the Adirondack Park is the largest publically protected area in the United States and is larger than Yellowstone, Everglades, Glacier, and Grand Canyon

National Park combined. Approximately 43% of the Park is publically owned and constitutionally protected to remain “forever wild” forest preserve. The remaining acreage is made of up private land holdings. There are no wind facilities within the borders of the Park, but as you can see in Figure 1, the facilities in our study are very close. There are six wind farms in our study area, as summarized in Table 1.¹¹

Table 2 presents a comparison of the counties in our study area to the New York State and United States averages for population density, per capita income, and home prices. As that table shows, our study area is a very rural, lightly populated area of small towns and villages that is also less affluent than the state average. The largest population center in our study area is Plattsburgh, NY with a 2000 population of about 18,000.

3 Data and Methodology

Our data consists of a nearly complete sample of 11,331 residential and agricultural property transactions in the Clinton, Franklin and Lewis Counties from 2000-2009. Of these there are 1,938 from Lewis, 3,251 from Franklin, and 6,142 from Clinton Counties. Each observation constitutes an arms-length property sale in one of the three counties between 2000 and 2009. Parcels that transacted more than once provide a greater likelihood of observing specific effects from the turbines on sales prior to and after installation. In total, 3,969 transactions occurred for 1,903 parcels that sold more than once during the study period.¹²

Transacted parcels were mapped in GIS to enable us to calculate relevant geographic variables for use in the regressions. Turbine locations were obtained from two different sources. In Lewis County, a GIS shapefile was provided by the county which contained 194 turbines. According to published information on the Maple Ridge wind

project, there are 195 turbines at the facility (Maple Ridge Wind Farm). Noble Environmental Power would not provide any information on their turbine locations so 2009 orthoimagery was utilized to create a GIS shapefile with the turbine locations in Franklin and Clinton Counties.

Turbine locations in combination with several other datasets were merged using ESRI ArcView GIS software and STATA data analysis and statistical software to form the final dataset. Transacted parcels were mapped in GIS to determine the distance to the nearest turbine. Distances are used as a proxy to estimate the nuisance effects of the turbines (i.e., view-scapes, noise impacts, perceived health effects). The distance to turbines was exported from GIS and combined with the other parcel level details in STATA. Table 3 summarizes the datasets that were used in the analysis and their sources. Table 4 provides summary statistics for many of the variables included in our analysis.

Unfortunately, we have relatively few transactions that are very close to the turbines. In the full sample data there are 461 transactions within 3 miles of a turbine with 92 in Clinton County, 118 in Franklin County, and 251 in Lewis County. In the repeat sales data, there are 142 transactions within 3 miles of a turbine: 41 in Clinton County, 34 in Franklin County, and 67 in Lewis County. Table 5 presents a count of transactions at various distances from turbines by county for each of our two datasets.

3.1 Methodology

Our analytical approach to estimating the effects of wind turbines on property values is that of a repeat sales fixed-effects hedonic analysis.¹³ We are attempting to estimate the ‘treatment’ effect of a parcel’s proximity to a wind turbine. There are a number of

difficulties in measuring the effect of turbines. First and foremost, there is a question of when a turbine should be said to ‘exist.’ The obvious answer is that turbines exist only after the date on which they become operational. However, there is a long approval process associated with development of these projects and local homeowners presumably will have some information about where turbines will be located some years before they actually become operational. To deal with this issue, we run our regressions with three different assumptions about the date of existence - the date the draft environmental impact statement (EIS) was submitted to the New York State Department of Environmental Conservation, the date the final environmental impact statement was approved, and the date at which the turbines became operational.

In addition, given the uncertain and possibly diverse physical/aesthetic impacts of turbines, it is difficult to know how to measure proximity. Is it distance to the turbine, whether or not the turbine can be seen, whether or not the turbine can be heard/felt, or all of the above? For all of these factors, it is reasonable to suspect that distance would work as a proxy measure. That is, homes closer to turbines will be more likely to see the turbines and more likely to hear or feel vibrations from the turbines. In Clinton and Franklin Counties, the turbines are located in a broad river valley (the St. Lawrence) with only small hills that are unlikely to obstruct turbine views; in Lewis County the turbines are on top of a large plateau. In our regions then, proximity should be a good measure of impacts. So, all of the measures that we employ will be distance based, starting with the simplest - the inverse of the distance to the nearest turbine.¹⁴ This inverse distance measure is also calculated with the date of the turbines’ existence in mind. So, distance will decrease (inverse distance will increase) for all parcels after new turbines come into existence. Specifically, at the beginning of our sample period there are no commercial turbines in the study counties. However, there are turbines outside of the study counties that are counted

as the ‘nearest turbines’ for the purposes of measuring distance. The distances to these turbines are approximated by measuring the distance from these facilities to the centroid of each of the study counties. As new facilities are built, both inside and outside the study area, these distances are updated. At the time that the Lewis County facility final EIS is submitted, those become the closest turbines for the entire sample area. When the facilities in Clinton and Franklin facilities come online distances are again updated. Because, initially, the nearest turbines are out of the sample area, we also ran the analysis assuming that the nearest turbine was infinitely far away. The results of this specification however do not change significantly from those reported below.¹⁵

In addition to the relatively simple distance measure, which imposes a particular functional form to the distance effects, we also include a series of distance dummies which indicate the range in which the nearest turbine lies. This approach allows for non-linear, and non-monotonic, impacts to be measured. These variables also change over time as new turbines are sited, which is necessary to implement a fixed effects approach. Table 6 presents summary statistics for various measures of the effect of wind turbines.

In addition to these various measures of the proximity of homes to wind turbines, we include a number of other covariates. These include distance to the nearest major road, the value of any personal property included in the transaction, whether or not the home is in a ‘village,’ which would imply higher taxes, but also higher services and proximity to retail stores and restaurants, in addition to standard home characteristics including number of bedrooms, bathrooms, half-baths, the square footage of the house, the age of the home, and the size of the lot. We also include parcel level land cover data which tells us the share of each parcel in a number of different land cover categories (woodland, pasture, crops, water, etc.). To capture possible

information asymmetries between buyers and sellers we include a dummy variable for whether or not the buyer was already a local resident or moving in from outside of ‘the North Country.’ This is particularly important since there is good reason to believe that local residents would have more information about the future location of turbines, and about any associated disamenities than someone less familiar with the area. Finally we include a series of relatively subjective measures of construction quality and property classification (mobile homes, primary agriculture, whether or not the home is winterized, etc.) that come from the NYSORPS (New York State Office of Real Property Services) assessment database.

3.1.1 Empirical Issues

There are three main empirical issues that we have to deal with in accurately estimating the effects of wind developments on property values through a hedonic analysis: omitted variables, endogeneity, and spatial dependence/autocorrelation. As Greenstone and Gayer (2009), Parmeter and Pope (2009), and others, lay out, omitted variables bias is a major concern in any hedonic analysis. Put simply, there are almost innumerable factors that co-determine the price of a property, and many or most of these factors are unobservable to the researcher. If any of the unobserved factors are also correlated with included factors, then the resulting coefficient estimates will be biased. Equally concerning in attempting to accurately estimate the effects of a discrete change in landscape, like the construction of a wind turbine, is endogeneity bias. This bias has a similar effect as omitted variables bias but a slightly different cause. Endogeneity bias enters when the values of the dependent and one or more independent variables are co-determined. In the case of hedonic models, if property values determine the location of some facility, and that facility also impacts property values, we have endogeneity bias. In our case we do need to be concerned about

this since it is likely that, *ceteris paribus*, wind turbines will be sited on lower-value, cheaper land. Then, if this is not corrected, we might falsely conclude that wind turbines negatively impact property values or, at least, overstate any negative impacts, simply because wind turbines are placed on cheaper land. This selection effect would cause us to confuse correlation with causation.

As developed in Greenstone and Gayer (2009), Parmeter and Pope (2009), and Kuminoff, Parmeter, and Pope (2010), spatial fixed effects analysis can be a solution to both of these problems in hedonic analysis. Fixed effects work by including a set of spatial dummy variables in the regression which correspond to groupings of the observations. In this way, any static features of the groups that affect property values will implicitly be controlled for by these dummy variables. Essentially, we are allowing for group-specific constant terms. So, many otherwise omitted effects which occur at the level of the groups (the fixed effects scale) will now no longer be omitted. Similarly, if, within groups, the occurrence of the variables of interest (the placement of wind turbines, in our case) is random, we will have controlled for endogeneity bias as well.¹⁶

The geographic scale of the fixed effects, or the size of the groups, is a critical issue. The smaller the geographic scale of the fixed effects, the tighter the controls will be for endogeneity and omitted variables biases. Following this logic, the cleanest analysis would be using repeat sales where the fixed effects are implemented at the parcel level.¹⁷ There are tradeoffs, however. The first arises since variation in the remaining observable explanatory variables can only be observed within the groups, a smaller geographic scale means less variation and less power with which to estimate these remaining coefficients. That is, if we are interested in the distance from each parcel to the nearest major road, the statistical power to measure this comes only from variation in this distance within the scope of the fixed effects (i.e. the census

block). Presumably, since homes within a census block are all close to each other, they will all be a similar distance to the nearest road and thus there is limited variation with which to measure this effect. In a repeat sales analysis, since parcel location and most other characteristics are assumed to be fixed, one can only estimate the effects of time-variant factors. The second tradeoff is that, in general, repeat sales are relatively rare and so to implement such an analysis, one will be forced to ignore a large percentage of all observations. This also brings to light the possibility of a sample selection bias if those homes that sell more than once are not representative of the general population of parcels. In this paper, we experiment with these tradeoffs by using three different levels of fixed effects analysis - census block-group, census block, and repeat sales analysis.¹⁸ To give a sense of the scale of these different approaches, consider that in our study area, there are 92,960 total parcels, 1,997 census blocks, and 17 census block groups, which implies that, on average, there are 46.55 parcels per block, and 5,468.24 parcels per block group. The average census block has an area of just under 2 square miles, and the average census block group, about 232 square miles.¹⁹ We conduct all of our analysis at the county level. That is, we do not pool our datasets from the three counties in the study area but instead run each specification separately for each county.²⁰

Finally, we have to be concerned about spatial dependence and spatial autocorrelation. There is no doubt that homes that are close to each other affect each other's prices (spatial dependence) and that unobserved factors for one home are likely to be correlated with unobserved factors for nearby homes (spatial autocorrelation or spatial error dependence). These factors could bias our coefficient and standard error estimates if not corrected. We correct for these issues using fixed effects, again, for the first and error clustering for the second. The fixed effects analysis is akin to employing a spatial lag model with a spatial weights matrix of ones for pairs of parcels

within the same geographic area, the scale of the fixed effects, and zeros for pairs of parcels in different areas. Likewise, the error clustering allows for correlation of error terms for parcels within an area and assumes independence only across areas (Cameron and Trivedi, 2010). This is akin to employing a spatial error model with the spatial weights matrix as described just above to control for spatial autocorrelation.²¹ In this way it also controls for heteroskedasticity (Wooldridge, 2002).

Formally, we estimate two regression equations. The first uses census block or block group fixed effects:

$$\ln p_{ijt} = \lambda_t + \alpha_j + z_{ijt}\beta + x_{ij}\delta_{jt} + \eta_{jt} + \epsilon_{ijt} \quad (1)$$

where p_{ijt} represents the price of property i in group j at time t ; λ_t represents the set of time dummy variables; α_j represents the group fixed effects; z_{ijt} represents the treatment variables - the different measures of the existence/proximity of turbines at the time of sale; x_{ij} represents the set of other explanatory variables; and η_{jt} and ϵ_{ijt} represent group and individual-level error terms respectively. This specification is adapted from Heintzelman (2010a, 2010b) and follows from Bertrand, Duflo, and Mullainathan (2004) and Parmeter and Pope (2009).

Following again from Bertrand, Duflo, and Mullainathan (2004), the second regression equation uses the repeat sales approach which is an adaptation of the model above:

$$\ln p_{it} = \lambda_t + \alpha_i + z_{it}\beta + \epsilon_{it} \quad (2)$$

where λ_t represents annual and seasonal dummies, α_i represents parcel fixed effects, z_{it} represents a vector of time varying parcel level characteristics, and ϵ_{it} is the error term. In effect, this analysis regresses the change in $\ln(\text{price})$ on the change in any

time-variant factors. In our case these time varying factors (z_{it}) are the variety of measures of the proximity of the parcel to wind turbines. Allowing for error clustering at the parcel level allows error terms to be correlated for different transactions of the same parcel.

4 Results

We first present results for the census block fixed effects analysis. Table 7 shows results for two models for each of the three counties. The first model includes only the log of the inverse distance to the nearest turbine, while model 2 instead includes a set of dummy variables indicating the range in which the nearest turbine is located.²² All of the results presented here assume that turbines exist at the date the Final Environmental Impact Statement (EIS) is issued. This accounts for the fact that local residents and most other participants in real estate markets will be aware of at least the approximate location of turbines before they are actually constructed. In fact, most of the turbine locations would be known, if not publically, well before this since developers typically negotiate with individual landowners before moving forward with regulatory approvals. Our results are quite robust to adjusting the date of ‘existence’ forwards to the date of the draft EIS. If we adjust this date backwards to the date of the permit being issued the results are qualitatively similar, but we lose significance - likely because we then have even fewer post-turbine transactions in the ‘treatment’ group.

First, notice that the covariate results are largely as would be predicted. Homeowners in this region prefer larger homes, with more bathrooms and fireplaces, and homes of higher quality grades. In 2 of three counties, homeowners also take into account the value of included property, while the age of the home has a generally

negative impact on price. The effect of being in a village varies by county, having a negative effect in Lewis (insignificant) and Clinton Counties and a positive impact in Franklin County. Lot size is only a significant factor in Franklin County in the census block fixed effects model, but is positive and significant in the unreported block group model. It also becomes significant in alternative specifications that exclude the village variable but are not reported here.²³ In all counties, local buyers pay somewhat less for homes than others. This result may have to do with asymmetric information, but may also be related to preferences or socio-demographics. Residents appear to not value additional bedrooms, but since we are controlling for house size, this result is likely because, *ceteris paribus*, more bedrooms means smaller bedrooms (or fewer and/or smaller other rooms). Properties with multiple units, including apartments, or mobile homes on a parcel reduce the price, while ‘estates’ receive a premium.²⁴ Seasonal homes have a negative and significant coefficient in 2 of 3 counties. Seasonal homes are generally homes deemed unsuitable for habitation during the winter months. Not surprisingly, parcels with more dedicated agricultural land are priced lower, controlling for acreage, and homes with open water or wetlands are more valuable. These measures are partially proxying for a home being waterfront.

The ‘Model 1’ results imply that proximity to wind turbines has a negative impact on property values in Clinton and Franklin Counties.²⁵ These proximity results are also robust to the inclusion of more detail about the location and density of nearby turbines.²⁶ The results of Model 2 are largely, but not entirely, consistent with those of Model 1. In Clinton and Franklin Counties we see negative impacts for having the nearest turbine within most zones representing proximity of less than 10 miles.²⁷ However, there are two significant estimates that imply a positive impact - between 0.5 and 1 miles away for Clinton County and between 2 and 3 miles away for Franklin County. In Lewis County, the only significant impact is a positive one at the range of

2-3 miles. These results are largely robust to changes in the size of the zones. When we include dummies for <1 miles, 1-2 mile, 2-3 miles, 3-5 miles and 5-10 miles, the positive result in Clinton County goes away, but those in Lewis and Franklin Counties remain.²⁸ Importantly, as illustrated in Table 5, we have relatively few observations for which the nearest turbine is within the ranges identified in these dummy variables. The implication of this is that it is relatively difficult to identify these effects. Given the small numbers, it is also possible that individual observations are having an undue impact on the estimates.

Table 8 presents results from the estimation of Equation 2 using parcel-level fixed effects. Here we see similarly negative and significant impacts of proximity to the nearest turbine in Clinton County, negative but insignificant impacts in Franklin County, and a positive but insignificant result in Lewis County. In both Clinton and Franklin Counties the estimated coefficients are somewhat smaller in magnitude in the repeat sales model than they were in the census block model, which is consistent with an endogeneity bias. The insignificance of the impacts in Franklin County is likely caused by the relatively small number of observations as the estimates presented for the $\ln(\text{inverse distance})$ variable have p-values in the range of 0.123-0.142 which is approaching significance. In Lewis County, the proximity measure is again positive but highly insignificant. The Model 2 results are largely negative and sometimes significant in Clinton and Franklin Counties, while the only significant results in Lewis County are positive. Adjusting the specification of the dummy variables as above makes no substantial difference in the repeat sales model. Local buyers still pay less than others, but this effect is only significant in Lewis County.

5 Discussion

Overall, the results of this study are mixed as regards the effect of wind turbines on property values. In Clinton and Franklin Counties, proximity to turbines has a usually negative and often significant impact on property values, while, in Lewis County, turbines appear to have had little effect, and, in some specifications, a positive effect. One possible interpretation, since the Lewis County turbines are older, is that the impacts of turbines decay over time so that the impacts we see in Clinton and Franklin Counties may be short-run impacts. To test this, we re-ran the Lewis County analyses having cut out any transactions after 2006 to restrict ourselves to the short-run. These results were not supportive of this interpretation as, if anything, the short-term impacts in Lewis County appeared to be more positive. Another possible interpretation is that there is something about the design or placement of the facilities in Lewis versus Clinton/Franklin Counties which has reduced or eliminated the negative impact on property values. It may also be heterogeneity in consumer preferences in the various counties that drives this dichotomy.

When turbines do impact values, the magnitude of this effect depends on how close a home is to a turbine. For Model 1, since we are using a log-log specification, the estimated coefficient on the log of the inverse distance measure represents the elasticity of price with respect to the inverse of the distance to the nearest turbine. So, a coefficient of $-\beta$ implies that a 1% increase in the inverse distance (a decrease in distance to the nearest turbine) decreases the sale price by $\beta\%$. Inverse distance declines as distance increases, so this tells us that the impacts of wind turbines similarly decay. Using the estimated coefficients above, we calculate the percentage change in price from a given change in distance. These results are presented in Table 9 for Clinton and Franklin Counties using estimated β s from Model 1 at both fixed effects

levels.²⁹ The double log/inverse distance specification enforces that the relationship between percentage price declines and distance be convex. To test for the robustness of this assumption we also tried quadratic and cubic distance specifications which would allow for a concave rather than convex relationship. The quadratic specification confirmed the convex shape of the relationship since the linear term was positive and significant and the quadratic term was negative and significant. The quadratic and cubic terms in the cubic specification were not significant.³⁰

From the repeat sales model we see that the construction of turbines such that for a given home in Clinton County the nearest turbine is now only 0.5 miles away results in a 8.8%-14.49% decline in sales price depending on the initial distance to the nearest turbine. For Franklin County, this range is 9.64%-15.81%. For the average properties in these two counties, this implies a loss in value of between \$10,793 and \$19,046. Obviously, at larger distances, these effects decline. At a range of 3 miles the effects are between about 2% and 8% or between \$2,500 and \$9,800.

Table 9 also shows that the predicted impacts are more severe when based on the census block model. In the case of Franklin County, we see declines of up to 35% at a distance of 0.5 miles. These results are indicative of endogeneity bias at this larger fixed effects scale. This is because we expect the endogeneity to take the form of turbines being located, all else equal, on lower quality, lower value land. If this is true, then we would expect our estimates to be biased downward. Our results fit this model. Nonetheless, it is heartening that the bias, particularly in Clinton County, does not appear to be especially severe.³¹

Table 10 provides the percentage price changes implied by the estimates from the Model 2 specification. The coefficients have been converted to percentage change following Halvorsen and Palmquist (1980). Although there is limited significance, as reported above, we do see significant declines in both Clinton and Franklin Counties

of up to 26% in the repeat sales model, and positive impacts, of up to 100% in Lewis County. The full sample results are less consistent. On the whole, the coefficients in the repeat sales model are smaller than those in the census block model, which is again suggestive of a selection effect being present in the full sample approaches.

It is also important to remember that our analysis includes year and month dummies to control for county-wide, market-level, price fluctuations, so we are not likely to be attributing these sorts of trends erroneously to the existence of turbines. Furthermore, looking at monthly average prices by county, unlike much of the rest of the country, our sample area did not experience any major upward trends in prices during the sample period, nor a decline towards the end. Being very rural and somewhat isolated also makes these counties relatively immune to national real estate trends.

As we began this analysis, we expected that there might be informational effects at play regarding local or non-local buyers of property since, presumably, local residents will have more information about where and when turbines might be built. We do see that local buyers, on average, pay less for properties than non-local buyers, but there does not appear to be a differential effect for these two categories in the effect of wind turbines. To test this, we ran an alternative specification of the census block model with the local-buyer dummy variable interacted with the proximity variable, and this term was not significant.

Finally, Parsons (1990) argues that the implicit hedonic prices of locational attributes of homes will vary with the size of the lot on which each home sits. We test the effects of lot size on the marginal impact of wind turbines using a lot size/proximity interaction term. In that specification of the census block model, we find that the estimated coefficient on this interaction term is positive and significant in both Clinton and Franklin Counties. This indicates that parcels with larger lots are not as badly impacted by the proximity of turbines as homes with smaller lots.

6 Conclusions

From a policy perspective, these results suggest that existing compensation schemes may not be fully compensating those landowners near wind developments, in some areas, for the externality costs that are being imposed. Existing PILOT programs and compensation to individual landowners are implicitly accounted for in this analysis since we would expect these payments to be capitalized into sales prices, and still we find largely negative impacts in two of our three counties. This suggests that landowners, particularly those who do not have turbines on their properties and are thus not receiving direct payments from wind developers, are being harmed and have an economic case to make for more compensation. That is, while the ‘markets’ for easements and PILOT programs may be properly accounting for harm to those who allow parcels on their property, it appears not to be accounting for harm to others nearby. This is a clear case of an uncorrected externality. If, in the future, developers are forced to account for this externality through increased payments this would obviously increase the cost to developers and make it that much more difficult to economically justify wind projects. Importantly, in Lewis County, landowners do appear to be receiving sufficient compensation to prevent decay of property values.

This study does not say anything about the societal benefits from wind power and should not be interpreted as saying that wind development should be stopped, even when the property value effects are negative. If, in fact, wind power is being used to displace fossil-based electricity generation it may still be that the environmental benefits of such a trade exceed the costs.³² However, in comparing those environmental benefits, we must include not only costs to developers (which include easement payments and PILOT programs), but also these external costs to property owners local to new wind facilities. Property values are an important component of any

cost-benefit analysis and should be accounted for as new projects are proposed and go through the approval process.

Finally, this paper breaks with the prior literature in finding any statistically significant property-value impacts from wind facilities. We believe that this stems from our empirical approach which controls for omitted variables and endogeneity biases and employs a large sample size with reasonably complete data on home and property characteristics. Future studies which expand this sort of analysis to wind and other renewable power facilities in other regions are imperative to understanding the big picture of what will happen as these technologies grow in prominence.

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Tables and Figures

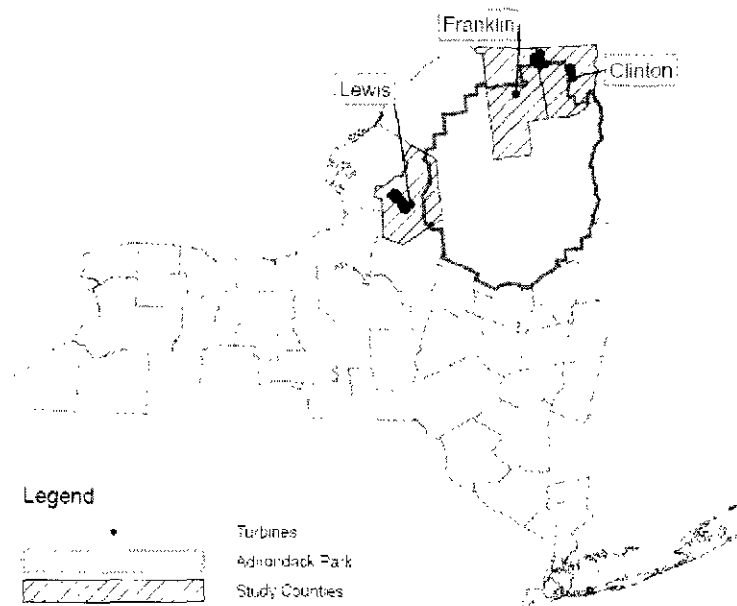


Figure 1: Study Area

Facility	County	Capacity (MW)	Turbines	Startup Year
Maple Ridge	Lewis	320	194	2006
Noble Chateaugay	Franklin	106.5	71	2009
Noble Belmont	Franklin	21	14	N/A
Noble Altona	Clinton	97.5	65	2009
Noble Clinton	Clinton	100.5	67	2008
Noble Ellenburg	Clinton	81	54	2008

Table 1: Study Area Wind Facilities

Geographic Area	2008 Median Income (\$)	2000 Pop. Density (ppl/sq. mi.)	2008 Median Value Owner-Occupied Homes (\$)
United States	52,029	86.8	119,600
New York State	55,980	401.9	148,700
Clinton	49,988	76.9	84,200
Franklin	40,643	31.4	62,600
Lewis	41,837	21.1	63,600

Table 2: Study Area Demographics (SOURCE: U.S. Census)

Description of Dataset	Source
Turbine Locations, Lewis County	Lewis County
Turbine Locations, Clinton & Franklin Counties	2009 Orthoimagery
2000-2009 Property Sales	NYS Office of Real Property Services (NYSORPS)
2009 Parcel Layer	Clinton, Franklin and Lewis Counties
2009 Parcel Level Details	NYSORPS
80-Meter Wind Potential	AWS Truepower
Census Blocks	NYS GIS Clearinghouse
Elevations	Cornell U. Geospatial Info. Repository
Land Cover	USGS
Streets	NYS GIS Clearinghouse

Table 3: Data Sources

Variable	Clinton		Franklin		Lewis	
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
Sale Price (\$)	\$122,645	\$83,603	\$120,466	\$354,556	\$81,740	\$63,207
Building Age (years)	37	41	49	109	50	42
Living Area (sq. ft.)	1,609	611	1,447	643	1,538	690
Lot Size (acres)	5.9	39.3	6.8	25.6	9.0	27.2
Distance to Nearest Major Road (Feet)	1,549	2,493	1,861	3,189	6,094	6,628
Value of Included Personal Property (\$)	\$63	\$965	\$324	\$6,995	\$204	\$2,678
Buyer from Local Area	0.913	0.282	0.790	0.407	0.684	0.465
Home in established Village	0.049	0.215	0.395	0.489	0.261	0.439
Full Bathrooms	1.615	0.647	1.312	0.618	1.287	0.630
Half Bathrooms	0.332	0.495	0.226	0.441	0.229	0.431
Bedrooms	3.134	0.936	2.829	1.051	2.929	1.140
Fireplaces	0.306	0.544	0.245	0.484	0.167	0.416
Excellent Grade Building Quality	0	0	0	0	0.0005	0.023
Good Grade Building Quality	0.031	0.173	0.019	0.137	0.013	0.112
Average Grade Building Quality	0.833	0.373	0.584	0.493	0.639	0.480
Economy Grade Building Quality	0.136	0.342	0.381	0.486	0.317	0.465
Minimum Grade Building Quality	0.001	0.028	0.016	0.127	0.031	0.174
Single-Family	0.859	0.348	0.755	0.430	0.677	0.468
Single-Family +Apt	0.001	0.025	0	0	0	0
Estate	0.0002	0.013	0.003	0.058	0	0
Seasonal Residences	0.032	0.175	0.111	0.314	0.181	0.385
Multi-Family Properties	0.054	0.226	0.046	0.209	0.043	0.203
Acreage/Residences with Ag Uses	0.043	0.202	0.054	0.226	0.054	0.225
Mobile Home(s)	0.0003	0.018	0.002	0.039	0.006	0.075
Other Residential Classes	0.007	0.081	0.012	0.107	0.011	0.106
Primarily Agricultural Use	0.005	0.071	0.018	0.135	0.029	0.168
Percent of Parcel Forested	0.202	0.324	0.269	0.353	0.319	0.371
Percent of Parcel Open Water	0.011	0.077	0.031	0.127	0.024	0.123
Percent of Parcel Fields/Grass	0.160	0.293	0.139	0.277	0.292	0.356
Percent of Parcel Wetlands	0.041	0.147	0.068	0.172	0.067	0.170
Percent of Parcel Developed	0.444	0.448	0.226	0.369	0.131	0.293
Percent of Parcel Open	0.141	0.256	0.268	0.344	0.164	0.290
Observations	6,142		3,251		1,938	

Table 4: Summary Statistics by County

Range	Full Sample Dataset				Repeat Sales Dataset			
	Clinton	Franklin	Lewis	Total	Clinton	Franklin	Lewis	Total
0-0.5 Miles	6	4	15	25	3	2	3	8
0.5-1 Miles	11	23	25	59	6	6	7	19
1-1.5 Miles	14	25	32	71	7	6	7	20
1.5-2 Miles	19	27	42	88	8	7	11	26
2-3 Miles	42	39	137	218	17	13	39	69
Total	92	118	251	461	41	34	67	142

Table 5: Count of Transactions with Turbines in Specified Ranges

Variable	Clinton			Franklin			Lewis		
	Mean	Std. Dev.	Max.	Mean	Std. Dev.	Max.	Mean	Std. Dev.	Max.
Distance to Nearest Turbine (miles, date of sale)	95.2	60.5	140.0	98.3	60.0	148.0	25.7	25.2	64.0
Distance to Nearest Turbine (miles, in 2009)	11.1	4.3	28.9	22.8	14.6	53.5	9.6	6.2	26.7
Inverse Distance to Nearest Turbine (date of sale)	0.05	0.19	8.23	0.04	0.21	7.81	0.24	3.18	151.97
Nearest Turbine is within 0.5 Miles	0.0010	0.031	1	0.0012	0.035	1	0.0012	0.035	1
Nearest Turbine is in the range 0.5 - 1 Miles	0.0008	0.029	1	0.0058	0.076	1	0.0058	0.076	1
Nearest Turbine is in the range 1 - 1.5 Miles	0.0005	0.022	1	0.0009	0.030	1	0.0009	0.030	1
Nearest Turbine is in the range 1.5 - 2 Miles	0.0008	0.029	1	0.0006	0.025	1	0.0006	0.025	1
Nearest Turbine is in the range 2 - 3 Miles	0.0037	0.061	1	0.0055	0.074	1	0.0055	0.074	1
Nearest Turbine is in the range 3 - 5 Miles	0.011	0.105	1	0.010	0.100	1	0.136	0.343	1
Nearest Turbine is in the range 5 - 10 Miles	0.104	0.306	1	0.016	0.127	1	0.236	0.425	1
Number of Turbines between 0 and 0.5 Miles	0.008	0.279	16	0.009	0.311	16	0.042	0.514	10
Number of Turbines between 0.5 and 1 Miles	0.028	0.686	23	0.038	0.561	15	0.113	1.120	21
Number of Turbines between 1 and 1.5 Miles	0.046	0.987	36	0.056	0.800	23	0.209	1.711	25
Number of Turbines between 1.5 and 2 Miles	0.062	1.250	43	0.071	0.985	34	0.298	2.091	29
Number of Turbines between 2 and 3 Miles	0.133	2.387	87	0.242	2.574	60	1.096	5.532	50
At Least 1 Turbine between 0 and 0.5 Miles	0.001	0.037	1	0.002	0.039	1	0.010	0.100	1
At Least 1 Turbine between 0.5 and 1 Miles	0.002	0.048	1	0.007	0.081	1	0.016	0.127	1
At Least 1 Turbine between 1 and 1.5 Miles	0.003	0.054	1	0.007	0.084	1	0.020	0.142	1
At Least 1 Turbine between 1.5 and 2 Miles	0.004	0.061	1	0.008	0.090	1	0.029	0.167	1
At Least 1 Turbine between 2 and 3 Miles	0.009	0.094	1	0.013	0.113	1	0.071	0.257	1

Table 6: Summary Statistics for Wind Turbine Variables - All Parcels

	Clinton		Franklin		Lewis	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
ln(Inverse Distance to Nearest Turbine)	-0.052***	-	-0.111***	-	0.046	-
Nearest Turbine is within 0.5 Miles	-	-0.221	-	-0.286*	-	0.389
Nearest Turbine is in the range 0.5 - 1 Miles	-	0.389*	-	-0.417***	-	-0.909
Nearest Turbine is in the range 1 - 1.5 Miles	-	-0.282**	-	-0.492	-	-0.559
Nearest Turbine is in the range 1.5 - 2 Miles	-	-1.086*	-	0.137	-	0.031
Nearest Turbine is in the range 2 - 3 Miles	-	-0.001	-	0.242*	-	0.213*
Nearest Turbine is in the range 3-5 Miles	-	-0.048	-	-0.230	-	0.070
Nearest Turbine is in the range 5-10 Miles	-	-0.054	-	-0.116	-	-0.021
Distance to Nearest Major Road (Feet)	0.000	0.000	-0.000***	-0.000***	-0.000	-0.000
Value of Included Personal Property (\$)	0.000	0.000	0.000***	0.000***	0.000**	0.000**
Buyer from Local Area	-0.084***	-0.090***	-0.199***	-0.204***	-0.054	-0.054
Home in established Village	-0.384***	-0.385***	0.192**	0.201***	-0.079	-0.097
ln(Lot Size)	0.002	0.002	0.085**	0.086***	0.032	0.055
Living Area (sq. ft.)	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
Building Age (years)	-0.002**	-0.002***	-0.002***	-0.002***	0.002	0.002
Building Age Squared	0.000***	0.000***	0.000***	0.000***	-0.000**	-0.000**
Full Bathrooms	0.057***	0.057***	0.157***	0.162***	0.119**	0.114**
Half Bathrooms	0.125***	0.125***	0.184***	0.189***	0.184***	0.184***
Bedrooms	-0.007	-0.007	0.018	0.015	0.002	0.003
Fireplaces	0.124**	0.124**	0.265***	0.270***	0.140***	0.142***
Excellent Grade Building Quality	-	-	-	-	0.130	0.094
Good Grade Building Quality	0.107***	0.194***	0.062	0.095	-0.136	-0.127
Economy Grade Building Quality	-0.160***	-0.156***	-0.325***	-0.323***	-0.301***	-0.303***
Aluminum Grade Building Quality	-0.680*	-0.664*	-0.568***	-0.587***	-0.706***	-0.705***
Single-Family + Apt	-0.743	-0.756*	-	-	-	-
Estate	0.407***	0.406***	0.819**	0.813**	-	-
Seasonal Residences	-0.169**	-0.171**	0.160	0.155	-0.153*	-0.157*
Multi-Family Properties	-0.178***	-0.180***	-0.271***	-0.275***	-0.323***	-0.336***
Average/Residues with Ag. Uses	-0.041	-0.051	-0.308***	-0.372***	0.057	0.054
Mobile Home(s)	-0.282***	-0.289***	-1.504***	-1.482***	-0.736	-0.752
Other Residential Classes	0.349	0.359	-0.206	-0.207	0.201	0.199
Primarily Agricultural Use	-0.193	-0.167	0.110	0.101	-0.248	-0.292
Percent of Parcel Forested	-0.406*	-0.407*	0.038	0.035	0.105	0.116
Percent of Parcel Open Water	0.601***	0.599***	1.700***	1.515***	0.684***	0.693***
Percent of Parcel Fields/Grass	-0.086	-0.083	-0.163**	-0.175**	0.056	0.069
Percent of Parcel Wetlands	0.165**	0.165**	0.237**	0.234*	0.261*	0.294**
Percent of Parcel Developed	0.142***	0.139***	-0.186***	-0.187***	-0.050	-0.054
Constant	10.357***	10.653***	9.877***	10.445***	10.246***	10.108***
Number of Observations	6,142	6,143	3,251	3,251	1,938	1,938
Adjusted R ²	0.277	0.277	0.331	0.328	0.229	0.235
Year and Month Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Clustered Errors	Yes	Yes	Yes	Yes	Yes	Yes

note: *** p<0.01, ** p<0.05, * p<0.1

Table 7: Regression Results (Coefficient Estimates) - Census Block Fixed Effects

Variable	Clinton		Franklin		Lewis	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
ln(Inverse Distance to Nearest Turbine)	-0.011**	-	-0.044	-	0.034	-
Nearest Turbine is within 0.5 Miles	-	-0.109	-	-0.065	-	0.435
Nearest Turbine is in the range 0.5 - 1 Miles	-	-0.059	-	-0.027	-	-0.050
Nearest Turbine is in the range 1 - 1.5 Miles	-	0.038	-	-	-	0.740***
Nearest Turbine is in the range 1.5 - 2 Miles	-	0.103	-	-0.302**	-	0.420*
Nearest Turbine is in the range 2 - 3 Miles	-	-0.106*	-	-0.036	-	-0.180
Nearest Turbine is in the range 3-5 Miles	-	-0.166***	-	-0.095	-	-0.008
Nearest Turbine is in the range 5-10 Miles	-	0.070	-	-0.019	-	-0.011
Buyer from Local Area	-0.057	-0.059	-0.046	-0.044	-0.150*	-0.163**
Constant	10.955***	11.162***	10.231***	10.458***	10.504***	10.389***
Number of Observations	2,259	2,259	1,077	1,077	633	633
Adjusted R ²	0.2	0.199	0.233	0.229	0.284	0.297
Year and Month Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Clustered Errors	Yes	Yes	Yes	Yes	Yes	Yes

note: *** p<0.01, ** p<0.05, * p<0.1

Table 8: Regression Results (Coefficient Estimates) - Repeat Sales

Distance to Nearest Turbine (Miles)	Clinton County		Franklin County	
	Repeat Sales	Census Block	Repeat Sales	Census Block
Initial Distance = 25 Miles	$\beta = -0.041^{**}$	$\beta = -0.052^{***}$	$\beta = -0.044$	$\beta = -0.111^{***}$
0.1	19.82	27.80	21.57	45.82
0.25	16.82	23.79	18.34	40.02
0.5	14.49	20.61	15.81	35.22
1	12.08	17.30	13.21	30.04
2	9.61	13.84	10.52	24.45
3	8.13	11.76	8.91	20.97
Initial Distance = 15 Miles				
0.1	18.16	22.94	19.79	42.66
0.25	15.11	19.18	16.49	36.52
0.5	12.72	16.21	13.90	31.44
1	10.27	13.14	11.23	25.96
2	7.74	9.95	8.48	20.04
3	6.23	8.03	6.84	16.36
Initial Distance = 5 Miles				
0.1	14.49	18.41	15.81	35.22
0.25	11.29	14.43	12.35	28.29
0.5	8.80	11.28	9.64	22.55
1	6.23	8.03	6.84	16.36
2	3.60	4.65	3.95	9.67
3	2.02	2.62	2.22	5.51

note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 9: Estimated Percentage Price Declines using Model 1, Selected Distances

	Repeat Sales			Census Block		
	Clinton	Franklin	Lewis	Clinton	Franklin	Lewis
Nearest Turbine is within 0.5 Miles	-10.37	-6.33	54.53	-19.98	-25.02*	47.48
Nearest Turbine is in the range 0.5 - 1 Miles	-5.73	-2.63	-4.88	46.29*	-34.07***	-59.71
Nearest Turbine is in the range 1 - 1.5 Miles	3.87	-	109.50***	-24.60**	-38.85	-42.83
Nearest Turbine is in the range 1.5 - 2 Miles	10.87	-26.10**	52.17*	-66.25*	14.73	3.15
Nearest Turbine is in the range 2 - 3 Miles	-10.06*	-3.58	-16.45	-0.08	27.44*	23.79*
Nearest Turbine is in the range 3-5 Miles	-15.29***	-9.06	-0.75	-4.71	-20.56	7.26
Nearest Turbine is in the range 5-10 Miles	7.30	-1.90	-1.08	-5.22	-10.94	-2.08

note: *** p<0.01, ** p<0.05, * p<0.1

Table 10: Estimated Percentage Price Changes using Model 2

Notes

¹Data on the recent and future expected growth of wind energy are derived from the Energy Information Administration of the U.S. Department of Energy (<http://www.eia.doe.gov>).

²These symptoms are described by Nina Pierpont in her book on the topic, *Wind Turbine Syndrome* published in 2009.

³Renee Mickelburgh et al., "Huge protests by voters force the continent's governments to rethink so-called green energy", Sunday Telegraph (London), April 4, 2004, p. 28.

⁴See the DOI's Cape Wind Fact sheet (<http://www.doi.gov/news/doinews/upload/04-28-10-Cape-Wind-Fact-Sheet.pdf>) for details on the regulatory process surrounding the project.

⁵"WPEC sues Cape Vincent; Petition asks judge to nullify approval of impact statement," *Watertown Daily Times*. October 28, 2010.

⁶"Not on My Beach, Please," *The Economist*, August 19, 2010.

⁷"Cape Vincent Wind Turbine Development Economic Impact - Final Report", Submitted by Wind Turbine Economic Impact Committee, Town of Cape Vincent, NY, October 7, 2010.

⁸Department of Energy (http://www.windpoweringamerica.gov/wind_installed_capacity.asp).

⁹Department of Energy (http://www.windpoweringamerica.gov/wind_maps.asp).

¹⁰NYS Dept. of Environmental Conservation (http://www.dec.ny.gov/docs/permits_ej_operations_pdf/windstatuscty.pdf).

¹¹The Final Environmental Impact Statement for the Noble Belmont project in Franklin County was completed in conjunction with the Noble Chateaugay project. Construction for the combined project consisting of 85 turbines was initiated in 2008. While 71 turbines were brought online in 2009, site work for the additional 14 turbines was completed but the turbines themselves were never installed. Since the turbine bases are visible from ortho-imagery and the project environmental review was completed as a single project, these locations have been included in our analysis.

¹²In our repeat sales sample there are 3,251 transactions of parcels that sold twice, 649 that sold three times, 55 that sold four times, and 14 that sold 5 times. All of these that sold four or more times were hand-checked to make sure they seemed reasonable (no multiple sales in the same month, big jumps in price, etc.), and some were eliminated. We also eliminated all transactions that sold more often than this because it appeared that they were parcels that had been subdivided.

¹³For a summary and background on the use of hedonic analysis see Taylor (2003) or Freeman (2003).

¹⁴We measure the linear distance rather than road network distance since the effects are not a matter of travel to or from the turbines, but instead simple proximity.

¹⁵For Clinton and Franklin Counties, in fact, there is virtually no effect of this change. For Lewis County, making this change makes the effects of proximity more negative and more significant.

¹⁶For a thorough treatment of fixed effects analysis, see Wooldridge (2002).

¹⁷Repeat sales analysis was first developed by Bailey, Muth, and Nourse (1963) in the context of creating real estate price indices. Palmquist (1982) is the first application to environmental economics. There are many examples since then including Parsons (1992) and Gayer, Hamilton, and Viscusi (2002).

¹⁸To save space, results for the Census block-group analyses are not presented.

¹⁹We also attempted an instrumental variables approach to this problem using two instruments - the wind potential of each parcel and the elevation of each parcel. The first was strongly correlated with the location of turbines, but also correlated with property values - parcels that are exposed to higher winds are less desirable. The second instrument was not correlated with property values in our sample, but was not a strong predictor of the location of turbines. For these reasons, we abandoned this approach.

²⁰F-Tests did not support pooling in the block and block-group level fixed effects analyses because coefficient estimates were significantly different across counties. Pooling of Franklin and Lewis Counties was supported in the repeat sales analysis, but, for simplicity, we have chosen to conduct separate analyses throughout.

²¹Spatial autocorrelation, when applied at the property level in a repeat sales analysis, is similar to serial correlation in that the error term in one transaction is likely to be correlated with the error term in a transaction of the same property at a different date.

²²In other specifications, we also included a combination of dummy and count variables describing the number of turbines in various ranges up to 3 miles from the parcel. These variables, however, were highly collinear with each other and so estimates were largely insignificant and inconsistent.

²³These two variables are negatively correlated in our sample. The correlation coefficient is -0.2854.

²⁴Estates are defined according to NYSORPS as "A residential property of not less than 5 acres with a luxurious residence and auxiliary buildings."

²⁵The interpretation of the coefficient value is somewhat complicated and will be discussed in more detail below.

²⁶We also run a series of specifications including other continuous distance measures, as well as dummy and count variables representing geographic ranges up to 3 miles from a parcel. The results of the other distance specifications, while not reported here, are broadly consistent with the results of the log of the inverse distance estimation (Model 1) in that turbines do not seem to impact property values in Lewis County, but have largely negative and significant impacts in Clinton and Franklin Counties. The dummy and count variable results suffer from multi-collinearity, and are difficult to interpret.

²⁷Implicitly, the omitted category is those parcels with the nearest turbine being more than 10 miles away.

²⁸These results are not reported in detail for space considerations.

²⁹These results, being based on Model 1 in the tables, do not take into account the dummy or count variables estimates since these are so inconsistent and suspect because of the collinearity.

³⁰We also tested log-linear inverse distance and log-linear distance specifications and the results were consistent with those reported here. There was no evidence that these alternative specifications provided a better fit to the data.

³¹Although we do not report results here, estimates from the census block group model show a somewhat larger bias with larger negative effects from wind turbine proximity.

³²This is the subject of a recent working paper by Kaffine et al. (2011). Their analysis suggests that, in NY, wind is unlikely to create substantial emissions reductions because of the small share of electricity provided by coal-fired generators.