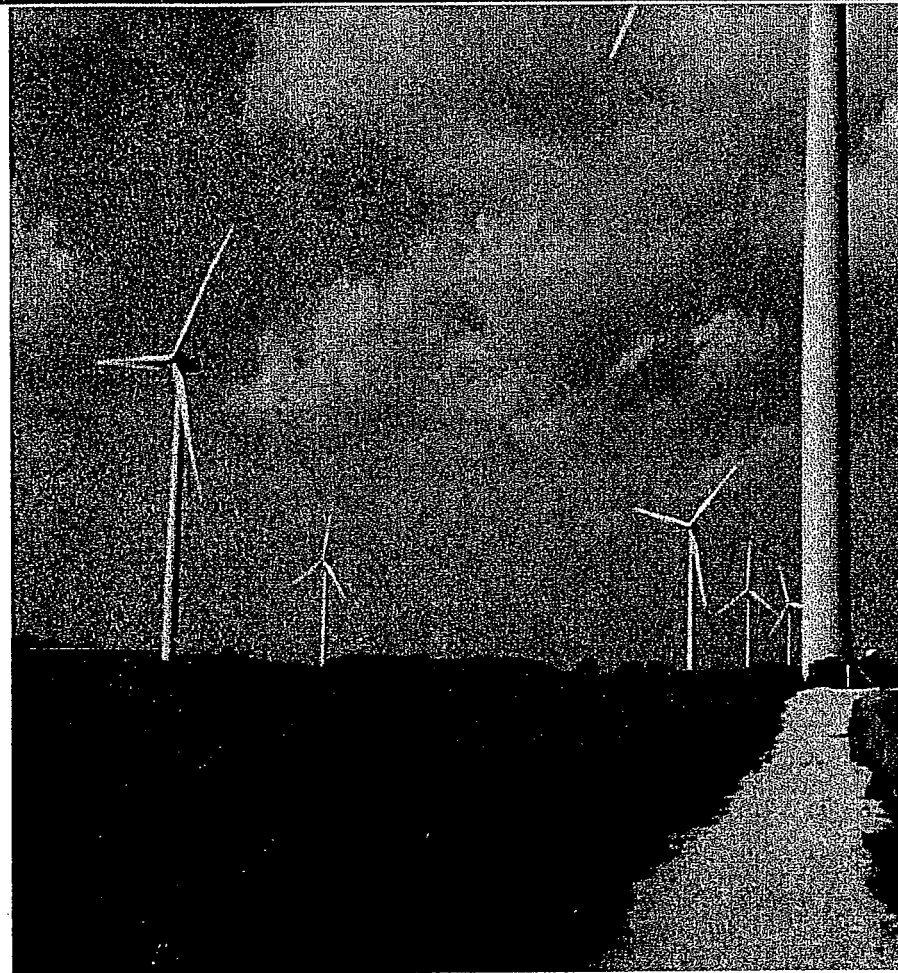


1.5 MW UNITS



2009

WIND TURBINE IMPACT STUDY



APPRAISAL GROUP ONE  
OSHKOSH, WISCONSIN  
9/9/2009

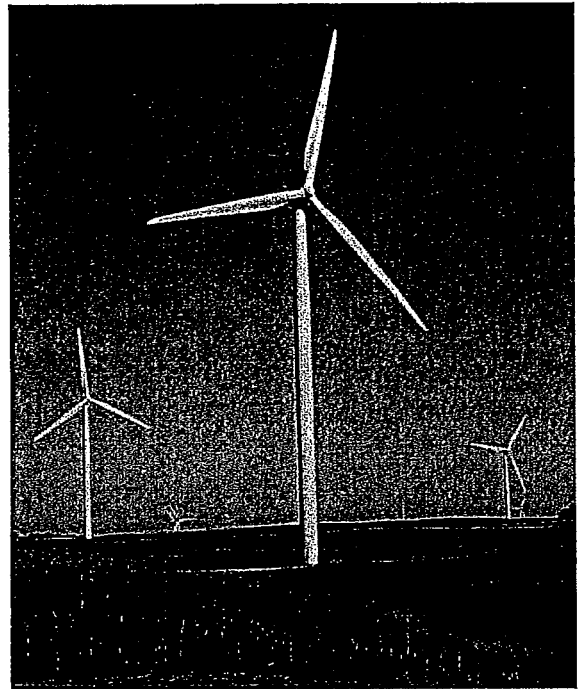
# WIND TURBINE IMPACT STUDY

## DODGE & FOND DU LAC COUNTIES – WISCONSIN

Preliminary Draft - September 2009

This is a study of the impact that wind turbines have on residential property value. The wind turbines that are the focus of this study are the larger turbines being approximately 389ft tall and producing 1.0+ megawatts each, similar to the one pictured to the right.

The study has been broken into three component parts, each looking at the value impact of the wind turbines from a different perspective. The three parts are: (1) a literature study, which reviews and summarizes what has been published on this matter found in the general media; (2) an opinion survey, which was given to area Realtors to learn their opinions on the impact of wind turbines in their area; and, 3) sales studies, which



compared vacant residential lot sales within the wind turbine farm area to comparable sales located outside of the turbine influence.

The sponsor for this study was the Calumet County Citizens for Responsible Energy (CCCRE) (Calumet County, Wisconsin), which contracted our firm, Appraisal Group One, to research the value impact that wind turbines have on property value. Appraisal Group One (AGO) protected against outside influence from CCCRE by having complete independence to the gathering of facts, data and other related material and the interpretation of this data to the purpose of this study. AGO chose the location of the study, the search parameters, the methodology used and the three-step approach to the study. AGO does not enter into any contract that would espouse any preconceived notion or have a bias as to the direction of the study and its findings. The purpose of the study was to investigate the value impacts of large wind turbines, the issues influencing these impacts and to report these findings on an impartial basis.

AGO is an appraisal company specializing in forensic appraisal, eminent domain, stigmatized properties and valuation research. This company is located in Oshkosh, Wisconsin,

and provides appraisal services throughout the State of Wisconsin. In addition, AGO provides forensic appraisal services, valuation consulting and research outside of the state. Recent projects were completed in Ohio, Indiana, Illinois and Michigan.

The geographic area of this study was focused in Dodge and Fond du Lac Counties. These two counties have three large wind farms. They are:

WE Energies - Blue Sky Green Field wind farm which has approximately 88 wind turbines and is located in the northeast section of Fond du Lac County, bordering Calumet County to the north.

Invenergy - Forward wind farm which has approximately 86 wind turbines and is located in southwest Fond du Lac County and northeast Dodge County.

Alliant - Cedar Ridge wind farm which has approximately 41 wind turbines and is located in the southeastern part of Fond du Lac County.

Of these three wind farms, only the WE Energies and Invenergy wind farms were used in the sales study since the Alliant – Cedar Ridge wind farm did not have enough viable sales within the turbine influence area to use as a base of comparison. The Realtor survey was limited to Fond du Lac and Dodge Counties, that being the area which had the three wind farms. The literature study was not limited geographically.

The balance of this report follows this introduction. The conclusions drawn at the end of each section are based on the data we collected and analyzed and are the sole possession of Appraisal Group One.

Submitted on September 9<sup>th</sup>, 2009, by:

Kurt C. Kielisch, ASA, IFAS, SR/WA, R/W-AC

President/ Senior Appraiser

Appraisal Group One

[www.forensic-appraisal.com](http://www.forensic-appraisal.com)

## WIND TURBINE IMPACT – REALTOR SURVEY

The purpose of the Realtor survey was to learn from the people who are on the first tier of the buying and selling of real estate what they thought of wind turbines and their impact to residential property value. This survey was designed to measure what type of impact (positive, negative or no impact) that wind turbines have on vacant residential land and improved property. The questions were designed to measure three different visual field proximity situations to wind turbines. These three were **bordering** proximity (defined as 600ft from the turbine), **close** proximity (defined as 1,000ft from the turbine) and **near** proximity (defined as ½ mile from the wind turbines). In all situations the wind turbines were visible from the property. Graphics and photographs were utilized to illustrate each question so the survey taker would have the same or similar understanding as others on each question. In addition to asking the Realtor about the type of impact they expected in each situation, the survey then asked them to estimate the percentage of the impact. Though it is understood that Realtors are salespeople and not appraisers, it is also true that they often have to estimate asking prices for their clients or act in the capacity of a buying agent for a client. Both situations demand an estimate of value and recognition of those factors that both benefit and detract from value.

The geographic area for selection of the survey participants was defined by the wind farm projects. These projects were in Fond du Lac and Dodge Counties, Wisconsin.

The Scope of Work (SOW) that was followed in the development, implementation and recording of this survey was as follows:

1. Outline the purpose of the questions and determine what is to be measured and what information is needed to have an informative survey free of any suggested bias.
2. Create a Beta version of the survey and have it tested by ten Realtors outside of the projected survey area.
3. Once the Beta testing and revisions were completed, then print the final version of the survey.
4. Realtor offices were presented with the survey and participants were offered a fee for taking the survey. (interestingly, some declined the fee.)
5. All surveys were given in person. No surveys were given orally nor via the Internet.
6. Once the surveys were completed the survey presenter signed and dated the survey.
7. All surveys were reviewed for errors and those that were found in error, e.g. giving multiple answers to a question when only one was allowed, were then rejected and saved with the reason for its rejection.
8. The survey results were tabulated and presented in a spreadsheet format.

9. From the spreadsheet the results were presented graphically for ease of understanding.
10. A summary of the findings and a conclusion was then completed and included in this report.

Following is: (a) a copy of the survey that was hand delivered to each survey participant and (b) graphic presentation of the tabulated results from the survey.

### Summary of Findings & Conclusion of Impact

The survey indicated that in all but two scenarios (those being Questions #8 and #9), over 60% the participants thought that the presence of the wind turbines had a negative impact on property value. This was true with vacant land and improved land. Where the group diverted from that opinion is when they were presented with a 10-20 acre hobby farm being in *close* and *near* proximity. In these cases 47% (close proximity) and 44% (near proximity) of the participants felt that the wind turbines caused a negative impact in property value.

The answers showed that *bordering* proximity showed the greatest loss of value at -43% for 1-5 acre vacant land and -39% for improved properties. Next in line was the *close* proximity showing a -36% value loss for 1-5 acre vacant land and -33% for improved property. Last in line was the *near* proximity, showing a -29% loss of value for a 1-5 acre vacant parcel and -24% loss in value for improved parcels. These losses show a close relationship between vacant land and improved land. This pattern was replicated regarding the *bordering* proximity for a hobby farm, whereas 70% believed it would be negatively impacted. Lastly, the opinions regarding the impact of the wind turbines due to placement, that being in front of the residence or behind the residence, showed that in both situations most participants believed there would a negative impact (74% said negative to the front placement and 71% said negative to the rear placement).

In conclusion, it can be observed that: (a) in all cases with a 1-5 acre residential property, whether vacant or improved, there will be a negative impact in property value; (b) with 1-5 acre properties the negative impact in property value in *bordering* proximity ranged from -39% to -43%; (c) with 1-5 acre properties the negative impact in property value in *close* proximity ranged from -33% to -36%; (d) with 1-5 acre properties the negative impact in property value in *near* proximity ranged from -24% to -29%; (e) in all cases the estimated loss of value between the vacant land and improved property was close, however the vacant land estimates were always higher by a few percentage points; (f) it appears that hobby farm use on larger parcels would have lesser sensitivity to the proximity of wind turbines than single family land use; and (g) placement either in front or at the rear of a residence has similar negative impacts.

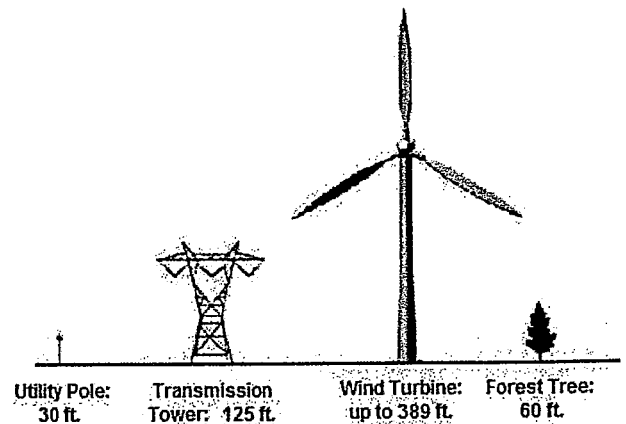
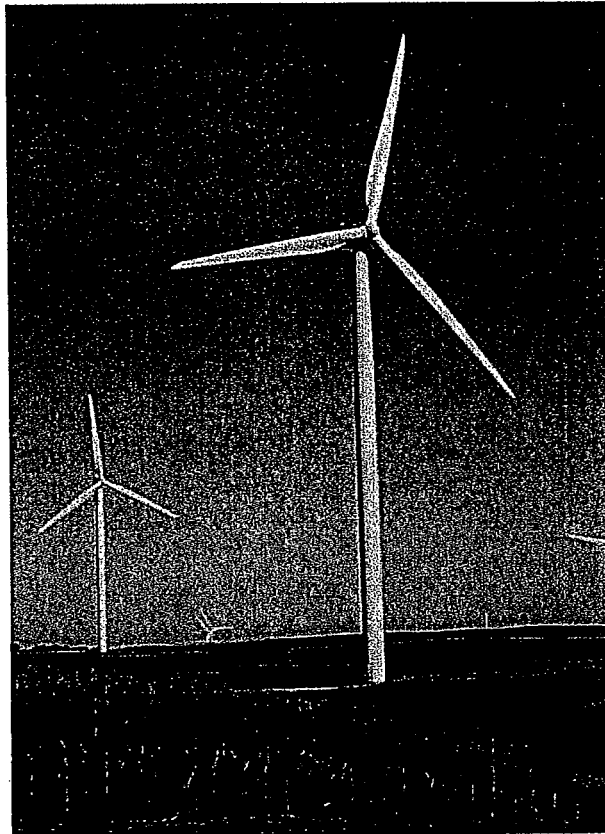
SAMPLE OF THE SURVEY  
FOUND ON THE FOLLOWING PAGES

## Wind Turbine Realtor Opinion Questionnaire

### A. Purpose of the questionnaire

This questionnaire seeks to find the opinion of real estate sales professionals on whether an industrial-scale wind turbine near a residential property has an impact on its property value. The questionnaire specifically defines terms such as “wind turbine,” “close proximity,” “near proximity” and “outlying proximity.”

**Wind Turbine** – for this questionnaire, a wind turbine is defined as a 1.5 MW industrial-scale wind turbine, approximately 389 feet tall from base to blade tip, at its highest point, with a blade diameter of approximately 252 feet. Such a wind turbine is pictured below, left. A comparison of the maximum height of industrial-scale turbines compared to other utilities and natural features is seen below, right.



Graphic: Impact of Wind Turbines on Market Value of Texas Rural Land. Derry T. Gardner of Gardner Appraisal Group, Inc. February 13, 2009. Original height of turbine altered for specific case

All dimensions to scale: 1 inch = 200 feet

**Visual Field Proximity** – for this questionnaire, “bordering proximity” is defined as 600 feet from turbine to residence, and easily seen from the subject property. “Close proximity” is defined as 1000 feet from turbine to residence, and readily seen. “Near proximity” is defined as ½ mile from turbine to residence, and seen in the distance. In the questionnaire you will see examples of each.





For this next set of questions, we are focusing on vacant residential land.

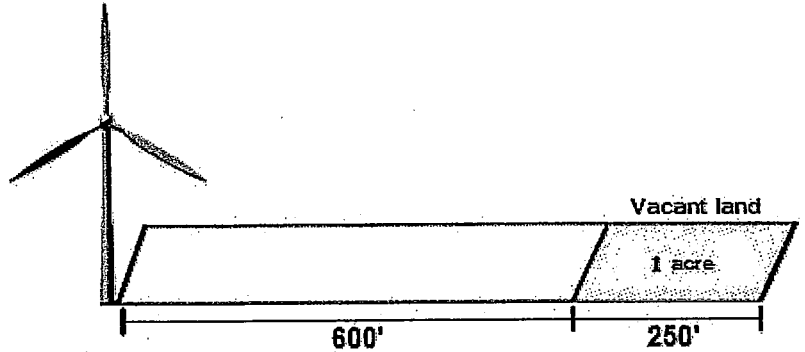
1. What is your opinion of the property value impact of wind turbines in **bordering proximity** to a 1-5 acre vacant residential lot? (see figure)

i. Do you believe the property value of the parcel in this example would be:

- Positively impacted
- Negatively impacted
- No impact

ii. In your opinion, what would be the percentage of impact?

- I would not know.
- I would estimate a negative impact in the range of \_\_\_\_\_%
- I would estimate a positive impact in the range of \_\_\_\_\_%



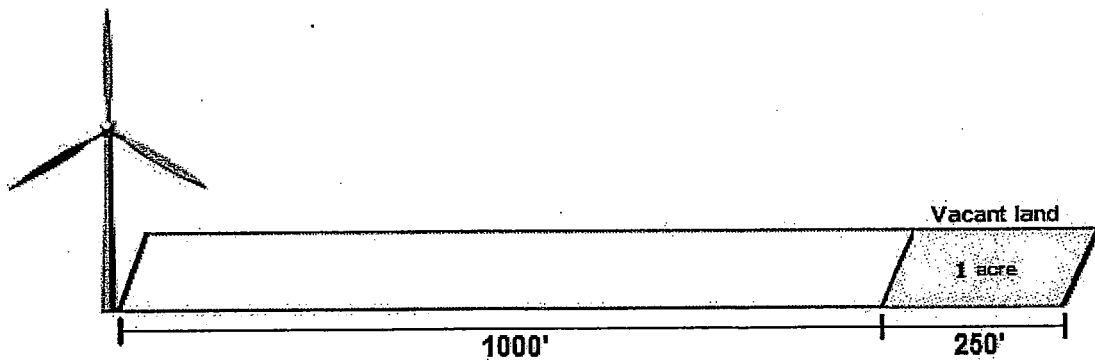
2. What is your opinion of the property value impact of wind turbines in **close proximity** to a 1-5 acre vacant residential lot? (see figure)

i. Do you believe the property value of the parcel in this example would be:

- Positively impacted
- Negatively impacted
- No impact

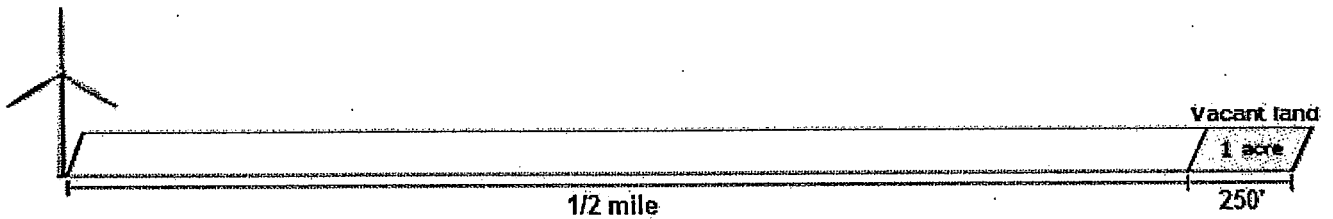
ii. In your opinion, what would be the percentage of impact?

- I would not know.
- I would estimate a negative impact in the range of \_\_\_\_\_%
- I would estimate a positive impact in the range of \_\_\_\_\_%



3. What is your opinion of the property value impact of wind turbines in **near proximity** to a 1-5 acre vacant residential lot? (see figure)

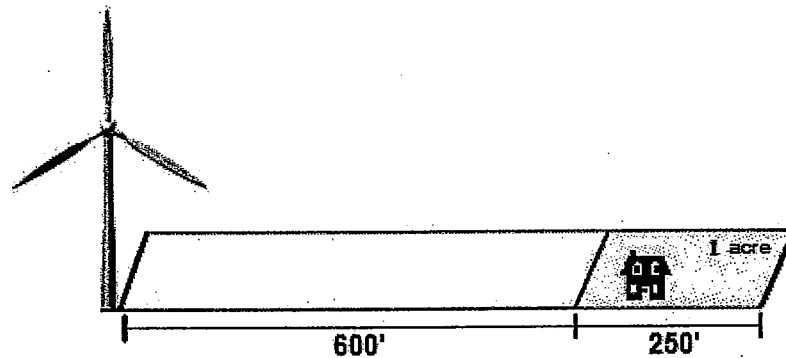
- i. Do you believe the property value of the parcel in this example would be
  - Positively impacted
  - Negatively impacted
  - No impact
- ii. In your opinion, what would be the percentage of impact?
  - I would not know.
  - I would estimate a negative impact in the range of \_\_\_\_\_%
  - I would estimate a positive impact in the range of \_\_\_\_\_%



For this next set of questions, we are focusing on improved residential land. "Improved" means there is a residence on the property.

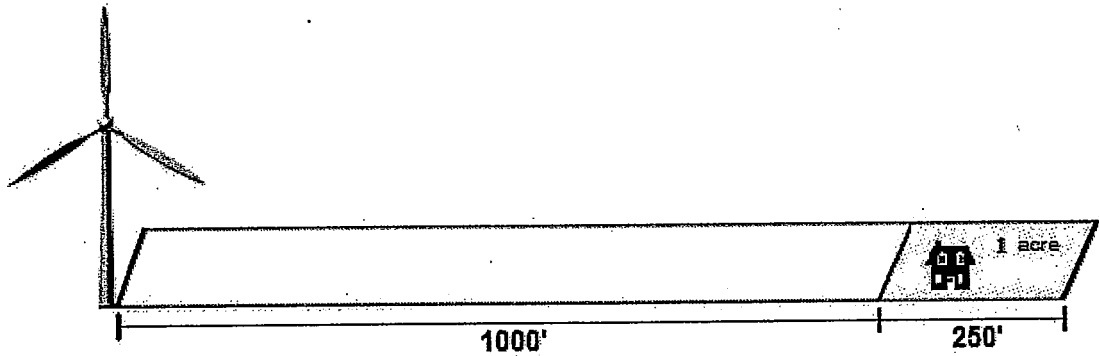
4. What is your opinion of the property value impact of wind turbines in **bordering proximity** to a 1-5 acre improved residential property? (see figure)

- i. Do you believe the property value of the parcel in this example would be
  - Positively impacted
  - Negatively impacted
  - No impact
- ii. In your opinion, what would be the percentage of impact?
  - I would not know.
  - I would estimate a negative impact in the range of \_\_\_\_\_%
  - I would estimate a positive impact in the range of \_\_\_\_\_%



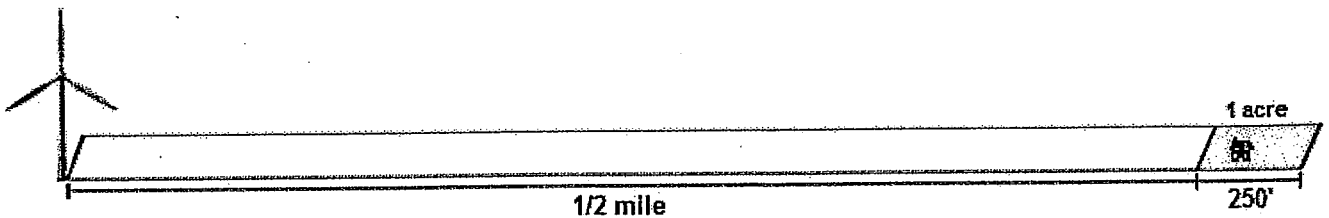
5. What is your opinion of the property value impact of wind turbines in **close proximity** to a 1-5 acre of improved residential property? (see figure)

- i. Do you believe the property value of the parcel in this example would be
  - Positively impacted
  - Negatively impacted
  - No impact
- ii. In your opinion, what would be the percentage of impact?
  - I would not know.
  - I would estimate a negative impact in the range of \_\_\_\_\_ %
  - I would estimate a positive impact in the range of \_\_\_\_\_ %



6. What is your opinion of the property value impact of wind turbines in **near proximity** to a 1-5 acre improved residential property? (see figure)

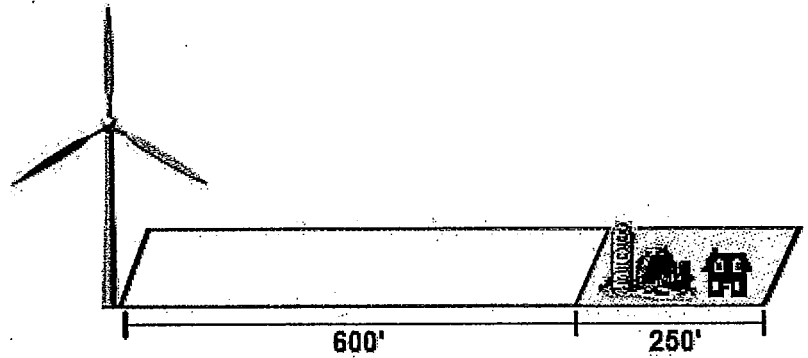
- i. Do you believe the property value of the parcel in this example would be
  - Positively impacted
  - Negatively impacted
  - No impact
- ii. In your opinion, what would be the percentage of impact?
  - I would not know.
  - I would estimate a negative impact in the range of \_\_\_\_\_ %
  - I would estimate a positive impact in the range of \_\_\_\_\_ %



7. Envision a hobby farm improved with a residence. It's 10-20 acres in size and has a wind turbine in **bordering proximity**.

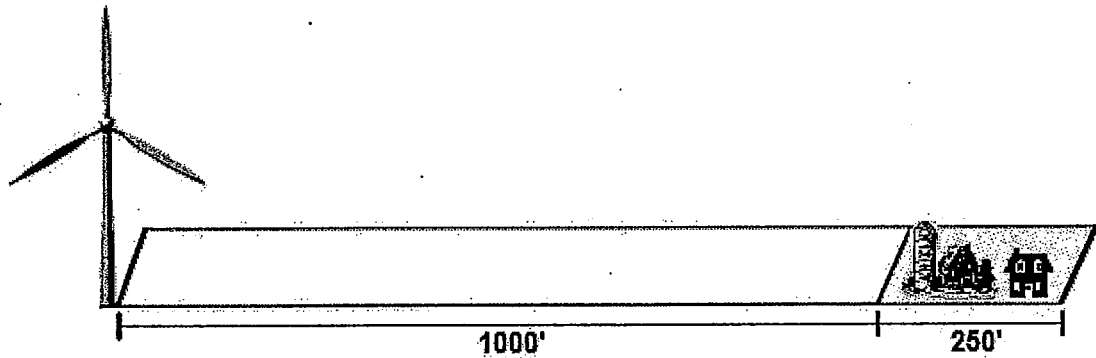
(see figure)

- i. Do you believe the property value of the parcel in this example would be
- Positively impacted
  - Negatively impacted
  - No impact



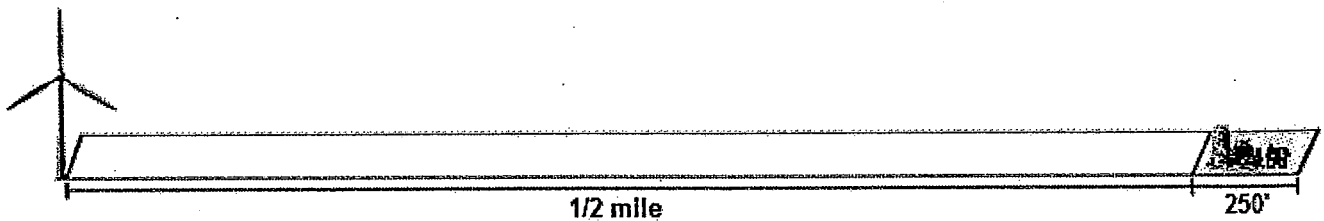
8. Envision a hobby farm improved with a residence. It's 10-20 acres in size and has a wind turbine in **close proximity**. (see figure)

- i. Do you believe the property value of the parcel in this example would be
- Positively impacted
  - Negatively impacted
  - No impact



9. Envision a hobby farm improved with a residence. It's 10-20 acres in size and has a wind turbine in **near proximity**. (see example on next page)

- i. Do you believe the property value of the parcel in this example would be
- Positively impacted
  - Negatively impacted
  - No impact



10. Assume that the wind turbine can be seen from the *front yard* of a 1-to-5 acre improved residential property as pictured below. Based on your professional experience would you say that this turbine would have:

- A positive impact on the property value
- A negative impact on the property value
- No impact on the property value



11. Assume that the wind turbine can be seen from the *back yard* of a 1-to-5 acre improved residential property as pictured below. Based on your professional experience would you say that this turbine would have:

- A positive impact on the property value
- A negative impact on the property value
- No impact on the property value.



Please feel free to include your own issues, comments or experiences (positive or negative) pertaining to wind turbines below:

---

---

---

---

---

---

---

---

---

---

---

---

---

Thank you for your help! Please date and sign below.

I have completed this questionnaire on \_\_\_/\_\_\_/\_\_\_\_\_ signed

---

Name: \_\_\_\_\_

Company: \_\_\_\_\_

Address of company: \_\_\_\_\_

Contact phone number: \_\_\_\_\_

(To be filled out by interviewer)

This questionnaire was given by \_\_\_\_\_

on \_\_\_/\_\_\_/\_\_\_\_\_

This questionnaire was given: \_\_\_ in person \_\_\_ by fax \_\_\_ by e-mail \_\_\_ by letter

If this questionnaire was given in person, at what location?

---