EL18-003 - In the Matter of the Application by Dakota Range I, LLC and Dakota Range II, LLC for a Permit of a Wind Energy Facility in Grant County and Codington County, South Dakota, for the Dakota Range Wind Project

49-41B-22. Applicant's burden of proof. The applicant has the burden of proof to establish that:

(1) The proposed facility will comply with all applicable laws and rules;

(2) The facility will not pose a threat of serious injury to the environment nor to the social and economic condition of inhabitants or expected inhabitants in the siting area;

(3) The facility will not substantially impair the health, safety or welfare of the inhabitants; and

(4) The facility will not unduly interfere with the orderly development of the region with due consideration having been given the views of governing bodies of affected local units of government.

Source: SL 1977, ch 390, § 17; SL 1981, ch 340, § 3; SL 1991, ch 386, § 6.

My name is Kristi Mogen, I live at 15160 471st Ave, Twin Brooks, SD.

My education level is several college credits at Pima Community College in Tucson Az. I have been a reporter and columnist for the Tucson Citizen, worked in property management, community planning and licensed Realtor for many years prior to a serious livestock accident in 1996. Since then I have been a master gardener, won tri state range management competition, earned a farmer's market manager certification and helped organize local farmers markets, I worked at a local quilt store, and taught quilt classes in the Mid-West regions, and been active in 4H prior to moving to Eastern South Dakota from Wyoming. Currently, I farm with my family and designed a specialty ruler for quilters.

My largest concern is the health and safety of people and my family living and working around industrial zones in too close of proximity. There are hundreds of stories, Vicki May, Ted Hartke, David Janes to name a few who are being dismissed and sound just like what my family lived through in Wyoming. My family, husband and two daughters, lived on our farm when an energy company started fracking 2 miles from our home and eventually moved in closer. The noise and vibrations from the constant drilling 2 miles away shook the walls of our home and kept us up all night long. We described it as living on the Denver Airport Tarmac 24/7. I am very concerned that these 4.2 MW turbines off-shore size, larger than any others in South Dakota, will eventually be less than 2 miles from our new farm that was to be our promise land. We escaped the torture of sleep deprivation, constant stress and not being able to enjoy our rural property. I am not an expert on noise, have spoken at length with Richard James, read many studies and now understand how some of the impacts we lived with before affected us. My family's health declined within 8 months of when industry moved near our home. After 2.5 years of not being able to sell our home, we had to abandon a home that we put blood, sweat and tears into, where my children spent time growing up, and building community bonds. People just do not just abandon their homes, the cost are great, but for me and my family it became life or death. I do not want to see that for our new community.

Besides noise, there is flicker. My oldest daughter has epilepsy. It is her plan to take over our small farm. She has worked with livestock all her life and attends seminars on a regular basis to keep up with the best management farming conservation practices. The threat of flicker, on our property, or as she is driving down the road to go to vo-tech school is life threating to her. She has worked hard and given up many teen activities to remain seizure free. One of those activities is school dances, where there are colored and strobe lights. She has vertigo issues if someone flicks the lights on and off in the house or at school. My family must turn off the ceiling fans when she is in the room. Flicker on our property or public spaces that she must use to go to school or work will change her life forever. I have seen flicker, it is not a shadow slowly moving across your lawn, it is startling, like a strobe light and flicker should not be allowed on non-participating landowners property or public spaces.

As a former Realtor, I am concerned with the number of homes that are abandon, no sales or long sales. For many people, especially in rural areas, their home and property are their nest egg. Owning property, putting down roots, helps lift people out of poverty, increases financial stability, drops crime rates and improves health and support systems. When people must abandon their homes, take reduced sale prices or longer sales there are opportunities and resources lost. A family losing a home may never financially recover. By allowing Industry to impact people by not protecting property rights and thru trespass with noise, flicker, infrasound, vibration, air turbulence, electromagnetic fields or electrical or radio frequency interference, there will be serious consequences to the health, finances, and social fabric of rural South Dakota.

I am concerned that the Codington County and Grant County CUP's do not resemble the Dakota Range 1 & 2 application to the PUC. Included in that application is the decommissioning report that understates the cost of decommissioning by a wind industry representative at the April 16th, 2018 Codington County Planning and Zoning meeting stating decommissioning is $200,000 per turbine. In exhibits, I have provided testimony from Diane Redlin and Jon Meyer about other concerns as well as the minutes from Grant County Commissioners, March 20, 2018 when the commissioners decided not to send a letter of support for Dakota Range 1 & 2. I have seen wind contracts, I have had attorneys tell me they advise against signing a one-sided contract, I would like PUC to evaluate a landowner contract. To trust someone is the South Dakota way. Many states have put out documents and even made legislation to protect landowners from harmful wind contracts. I like to know what other things have been misrepresented.

I am concerned that Grant County and Codington Board of Adjustments approved the CUP based on out dated ordinances and were not given all the facts about impacts to the community from Industrial Wind Turbines. The public has just 10 days' notice, to figure out if this industrial project will fit with our rural agricultural community. I was skeptical, having experience with living in an industrial zone, but a quick google search said wind turbines are green (yeah, no fossil fuels) and free energy. Nothing about health or community impacts, nothing about the 300 gallons of oil each turbine takes, nothing about the high cost to taxpayers thru subsidies, nothing about wildlife impacts, nothing about the local climate change or driving soil moisture out of the ground (dirty thirty's). I only learned of these issues as I studied for the past year about impacts. Dakota Range 1 & 2 siting has some Industrial Wind Turbines too close to people, each turbine is a power plant, and that does not belong in someone's backyard.

Please protect the health, property rights and the unique rural South Dakota way of life. I ask that the PUC deny EL18-003, it is not right for rural South Dakota.

Respectfully,

Kristi Mogen

April 24, 2018 • Letters, Minnesota

Lock up your wind rights

Credit: Fairmont Sentinel | Apr 24, 2018 | www.fairmontsentinel.com ~~

Here we go again. I strongly reject the false allegations in the recent front-page story about Tradewind Energy in the Sentinel. Tradewind is just another developer promising payments in trade for the total mess and divisiveness that pits neighbors against neighbors. Nothing tears a community apart like a wind farm that nobody wants, the country does not need and is built solely for the huge tax subsidies.

The article states the project will generate $1.2 million in tax revenue. This is only a projection that is not guaranteed. A more realistic approach is only $1.07 million, or 11 percent lower than Tradewind's projections. Also, Martin County only gets 80 percent of this money, with the other 20 percent shared with the hosting townships. You can argue it all stays inside the county boundary, but let's be specific as to who gets what.

Landowners who sign the lease only get $55 per acre. If you have a turbine on a 100-acre field, you only get $5,500? That is less than half the going rate that is

usually paid. That is not enough money to be compensated for the lights, noise, broken tile and all of the pain associated with a windfarm. Basically, it's only 15 bushels of corn you need to raise per acre to equal the small wind payment, plus you won't have to worry about hitting it with your spray plane or the crooked road tearing up your fields.

Lastly, the noise issue they site in the article is laughable. They say the turbines will be 45 decibels and only as loud as a refrigerator. Hessler Associates is an acoustical engineering firm used by wind developers and the Minnesota Public Utilities Commission and is considered supportive of the wind industry. The PUC requested and provided state staff to collaborate with David Hessler to write Assessing Sound Emissions from Proposed Wind Farms & Measuring the Performance of Completed Projects. Hessler writes, "… It would be advisable for any new project to attempt to maintain a mean sound level of 40 dB(A) or less outside all residences …" "Under no circumstances … should turbines be located in places where mean levels higher than 45 dB are predicted by pre-construction modeling at residences."

David Hessler's results and recommendations are that "under no circumstances" should turbines exceed 45

dB, yet Tradewind is OK with residents living with these dangerously loud machines.

It's time for the local landowners and residents to band together to lock up your wind rights to stop this project before they get started. If you need help killing this project, I am easy to find.

Dan Moore

former wind farm developer

Blue Earth

Source: Fairmont Sentinel | Apr 24, 2018 | www.fairmontsentinel.com

Cracks in onshore wind power foundations

Causes and consequences

Elforsk rapport 11:56



Manouchehr Hassanzadeh

January 2012

Vindforsk Energimyndigheten ELFORSK

003728

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Foreword

Some years ago Thomas Stalin at Vattenfall read an article in Neues Energi about 3000 turbines in Germany with damages in the foundations. In order to investigate how frequent crack are, for which type of foundations cracks have been observed and possible causes, this pre-study was therefore started within the Vindforsk programme.

The work has been carried out by the Manouchehr Hassanzadeh at Vattenfall. Thomas Stalin at Vattenfall has contributed with contacts and material for the study and contributed with reviews and discussions.

Vindforsk-III is funded by ABB, Arise windpower, AQ System, E.ON Elnät, E.ON Vind Sverige, EnergiNorge, Falkenberg Energi, Fortum, Fred. Olsen Renewables, Gothia Vind, Göteborg Energi, HS Kraft, Jämtkraft, Karlstads Energi, Luleå Energi, Mälarenergi, o2 Vindkompaniet, Rabbalshede Kraft, Skellefteå Kraft, Statkraft, Sena Renewable, Svenska kraftnät, Tekniska Verken i Linköping, Triventus, Wallenstam, Varberg Energi, Vattenfall Vindkraft, Vestas Northern Europe, Öresundskraft and the Swedish Energy Agency.

Comments on the work and the final report have been given by a reference group with the following members: Sven-Erik Thor, Vattenfall, Thomas Stalin Vattenfall, Henrik Berglund, Statkraft , Dan Sandros, Stena Renewable AB, Tomi Jokiranta, Fortum, Robert Lundström, Skelleftå Kraft, Rune Rönnholm, Triventus and Anders Björck Elforsk

Stockholm January 2012

Anders Björck

Programme manager Vindforsk-III

Electricity and heat production, Elforsk AB

Sammanfattning

Det finns många välutformade fundament för vindkraftverk, som inte är spruckna och uppfyller samtliga funktionskrav. Men det finns även fundament som har spruckit på ett sådant sätt att de inte uppfyller kraven med avseende på stabilitet och livslängd. Denna undersökning visar att sprickor i fundament för vindkraftverk är en fråga som måste tas på allvar. Rapporten visar att anslutningen mellan torn och fundament med en ingjuten stålring kan ge upphov till sprickbildning i betongen och bilda ett mellanrum mellan betong och stålringen. Trots att skadorna inte medför några omedelbara konsekvenser vad gäller bärförmåga kan de i det på lång sikt äventyra konstruktionens egenskaper och funktionsduglighet.

Det har påpekats att den huvudsakliga orsaken till de observerade skadorna har varit bristfällig utformning, det vill säga att man använt de konstruktionslösningar som har utvecklats för mindre anläggningar har tillämpats på de större vindkraftverken. Dessutom har skadeutredningar inte utförts på rätt sätt och resultaten inte har utnyttjats för att förbättra konstruktionsutformningen.

Förutom den ovan nämnda skadetypen förekommer två andra typer av sprickbildningar. Den ena typen är sprickor som uppkommer injekteringsbruket mellan anslutningsflänsen och betongfundamentet. Den här typen av sprickor uppkommer på grund av dåligt utförande och fel materialval. Den andra typen av sprickor uppkommer i höga socklar, d.v.s. socklar med en höjd mellan 4 och 8 m. Orsaken till sprickbildningen är bristfällig dimensionering av konstruktionen. Det bör noteras att fundament med höga socklar användes för att öka konstruktionens navhöjd. Den här typen av konstruktioner användes, dock, i en begränsad omfattning. Idag har man nästan övergett den här typen av konstruktion. Konstruktionen är inte vanligt förekommande i Sverige.

förekommer sprickor i injekteringsbruket mellan anslutningsflänsen och betongfundamentet samt betongsockeln. Den första skadan antas ha orsakats av dåligt arbetsutförande medan den andra antas ha orsakats av bristfällig utformning. Båda skadetyperna kan undvikas genom bättre arbetsutförande och utformning.

Baserat på undersökningens resultat rekommenderas att nya projekt initieras med följande innehåll:

- Utveckling av anvisningar för planering och produktion av fundament för vindkraftverk.
- Utveckling av anvisningar för produktion och kvalitetskontroll, inspektion och skadeutredning.
- Utveckling av anvisningar och handbok för reparation av skadade betongfundament.
- Utveckling av anvisningar för dimensionering av detaljutformning av fundament för vindkraftverk.
- Numerisk modellering av det strukturella beteende hos vindkraftverk som inkluderar torn, stiftelser, anslutningar och andra detaljer.

Summary

There are many perfectly designed wind power turbine foundations, which are not cracked and fulfil all functional requirements. However, there are foundations that have been cracked in such a way that they do not fulfil the requirements with regard to service life and structural stability. This investigation shows that cracking of the wind power turbine foundations is an issue which must be taken seriously. The report shows that the connection of the tower to the foundation by means of insert ring may lead to cracking of the concrete and formation of gaps between the concrete and the insert ring. Although the damages have no immediate consequences on the bearing capacity of the structure, they compromise the serviceability and long-term behaviour of the structure.

It has been pointed out that the main reason for the observed damages has been poor structural design, i.e. the solutions which were developed for smaller facilities, sometimes without thinking about possible consequences, have been applied to the larger wind turbines. Furthermore, the site investigations were not conducted properly and the findings were not brought back to the design praxis.

Besides the above-mentioned damage type two other types of cracking has been observed. One type is the cracking of the mortar grout between the connection flange and the concrete foundation. This type of cracking is caused by poor workmanship performance and inappropriate material selection. The other type observed is the cracks in the high pedestals, i.e. pedestals with a height of about 4 to 8 m. The cracks are caused by poor structural design. It should be noted that foundations with high pedestals were used in order to gain higher hub heights. This type of design was, however, not commonly used in the past and it is almost abandoned at the present time. This design has not commonly been used in Sweden.

Based on the results of the investigation it is recommended that new projects be initiated with following contents:

- Development of guidelines for planning and production of wind power turbine foundations.
- Development of guidelines for production and quality control, inspection and damage assessment.
- Development of guidelines and handbook for repair of damaged foundations.
- Development of guidelines for design and detailing of the foundations for the wind power turbines.
- Numerical modelling of the structural behaviour of the wind power turbines, towers, foundations, connections and other details.

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1 Introduction

1.1 Background

Foundations of the wind power turbines onshore are made of reinforced concrete. The reinforcement is non-stressed and is designed to carry the tensile stresses, and to distribute and to limit the size of the cracks in the concrete. The non-stressed reinforcement starts to function efficiently when concrete is cracked, i.e. cracks in reinforced concrete structures are not avoidable. Although cracks can't be avoided the structures must be designed in such a way that the cracks become evenly distributed and gain limited length, depth and width. Otherwise, the service life, and in some cases the stability and load bearing capacity, of the structures may be compromised.

Causes of the cracks in the wind power foundations onshore may have different origins such as poor material and structural design, poor execution of work, faulty detailing and lack of knowledge regarding loading and boundary conditions. The above-mentioned causes and faults are manifested as thermal and plastic shrinkage cracks during the production phase or in early age of the structure; drying shrinkage and other environmentally induced cracks later on; structural cracks caused by static and dynamic overloading, stress concentration around the details and creep. For instance, the dynamic loading may induce cracks, gaps, between the anchoring details cast in the concrete and the concrete. The water which penetrates in the cracks may cause leaching and/or frost-damage. In other cases the water may transport loose particles, such as fractured aggregates and cement paste, out of the crack or promote packing of the deeply located particles. The latter phenomenon may cause stress concentrations which may lead to widening of the cracks and may trigger off crack propagation.

At the present time there are many perfectly designed wind power turbine foundations, which are not cracked and fulfil all functional requirements. However, there are foundations that have been cracked in such a way that they do not fulfil the requirements with regard to service life and structural stability. It is important to investigate whether the cracking of the foundations is a rare phenomenon or not. If not what are the causes, in which way they may influence the structural behaviour of the wind power turbine construction and how the cracks can be prevented. Furthermore, how a cracked foundation can be repaired. Lack of knowledge in above-mentioned issues may have large economical consequences.

Wind power turbine foundations onshore engage several competencies such as structural design, material design, production, etc. Therefore, this project involves participants with different competencies. Furthermore, in order to ensure the steering of the project, to facilitate the engagement of the appropriate competencies and to save economical resources the project is subdivided in two phases, namely preliminary study (Phase 1) and detailed study (Phase 2).

The preliminary study (Phase 1) constitutes a limited part of the project and aims to show whether the detailed study (Phase 2) is necessary or not, and to prepare a project proposal if the Phase 2 is necessary.

1.2 Aims

The final aims of the project, both phases included, are to:

- document the failure process of cracking wind turbine foundations from examples in Germany and Denmark,
- determine types and causes of the cracks,
- develop guidelines for inspection, assessment and analyses in order to determine the causes of the cracks and
- develop guidelines for design and detailing of the foundations for the land based wind power turbines in Sweden in order to avoid cracks.

In order to achieve the final aims the project is planed to be conducted in two phases. The aims of the Phase 1 are given below, while the aims of the Phase 2 are described in general terms in section 6.2 of this report.

The aims of the Phase 1 are as followed:

- State-of-the-art report which includes type of foundations used for different types of towers and ground conditions, types of connections between towers and foundations used for different types of tower solutions, loading conditions, design basis, etc.
- Site visit and documentation of the observed cracks and the structural information.
- Preliminary analysis in order to describe the cause of the cracks
- Suggestions for a detailed study.

Only phase 1 is considered in this report.

1.3 Limitations

This report is based on information provided by a number of Swedish owners of wind power turbines and contractors, a German consultant and repair contactor. Furthermore a number of journals, books and internet sites have been used to complete this report. This report has no claim to have covered all types of problems in all countries regarding cracks in foundations of wind power turbines.

The author has received many valuable detailed inputs from individuals and companies regarding production techniques, repair methods, design methods, etc. Since, these subjects are somehow out of the range of the current phase of the investigation the inputs are not reflected or treated in this report.

1.4 Execution

This project has been conducted under the direction of a steering committee consisting of representatives from:

- Fortum AB
- Skelleftå kraft AB
- Statkraft AB
- Stena Renewable AB
- Triventus AB
- Vattenfall AB

with help of contractors Mobjer Entreprenad AB, SOLIDO (-Steinfurt.de) and Prof. Bellmer Ingenieurgruppe GMBH.

The author of this report visited Mobjer on February 28th, 2011; Prof Bellmer and Solido on March 28th and 29th, 2011.

2 Wind power onshore

2.1 Wind power structures

Figure 1 schematically shows the structure of an onshore wind power turbine. A wind power turbine is generically specified by the following technical specifications:

- Hub height i.e. the distance between the hub and the ground, H_{hub}, [m]
- The rotor's diameter, D_{rot}, [m]
- The total height, H_{tot}, [m] which is the sum of the hub height and the half of the rotor diameter
- Wind speed [m/s]
- Rotational speed of the rotor [r/min]
- Power [MW]

The three last items on the list are not single parameters, but they include a set of parameters which define conditions such as starting, operating and shutting down of the wind turbine. Below some of the parameters as defined by Germanischer Lloyd, [1], are presented.

Wind speeds are defined for four different conditions:

1. The "*cut-in wind speed*" is the lowest mean wind speed at hub height at which the wind turbine starts to produce power. Typical speeds 3 - 5 m/s.
2. The "*rated wind speed*" is the lowest mean wind speed at hub height at which the wind turbine produces the rated power. Typical speeds 10 - 14 m/s.
3. The "*cut-off wind speed*" is defined as the maximum wind speed at hub height at which the wind turbine must be shut down. Typical speeds over 25 m/s.
4. The "*short-term cut-out wind speed*" is the instantaneous wind speed at hub height above which the wind turbine must be shut down immediately.

The rotational speeds are defined for six different conditions. Three rotational speeds are defined within the operating range, where as the remaining three concerns with the shutting down conditions. Three of definitions are given below:

1. The "*rated speed*" is the rotational speed at the rated wind speed.
2. The "*set value of the speed controller*" is used for variable-speed plants in the operating state above the rated wind speed. In this operating state, the rotational speed will derivate upwards or downwards

from the set value only by the standard tolerance. Typical speed 20 – 35 rpm.

3. The "*cut-out speed*" is the rotational speed at which an immediate shutdown of the wind turbine must be effected by the control system.

Three different definitions are given for the power where as only the "*rated power*" concerns with the operating conditions. The "*rated power*" is defined as the maximum continuous electrical power at the output terminals of the wind turbine.

The load bearing structures of a wind power turbine may coarsely divided into six groups namely: rotor blades, machinery structures, nacelle covers and spinners, bolted connections, tower and foundation, Figure 1. It should be noted that a wind turbine can be divided into finer groups such as the structures which connect the foundation to the tower and the structures which connect the concrete part of a hybrid tower to the conical steel tube part of the tower, so called adapter. Since, this report deals only with the cracking of the foundations of the onshore wind power turbines, the presented subdivision is adequate for scope the report.

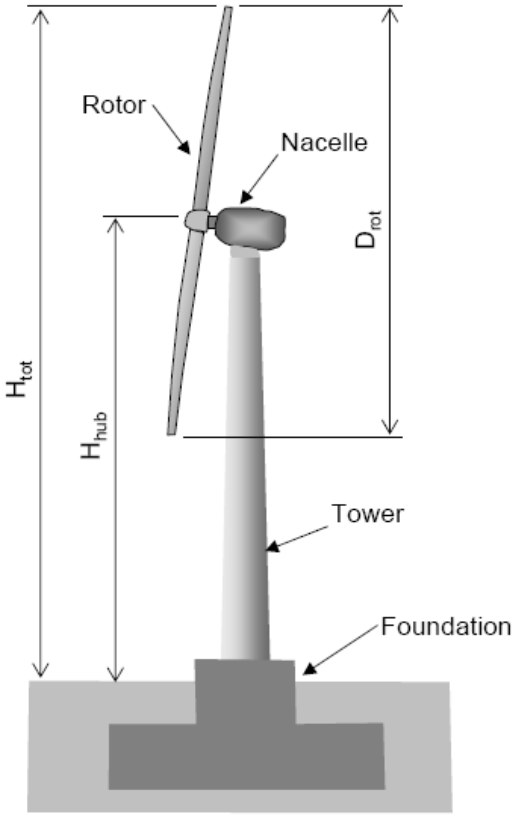


Figure 1 - Structures of a wind power turbine.

2.2 Wind energy, loads and load effects

The wind's kinetic energy is calculated by means of the following equation, [2]:

$$P_{kin} = \frac{1}{2}\rho A v^3 \qquad (1)$$

where, P_{kin} [W] is the kinetic energy, ρ [kg/m^3] is the density of the air, A [m^2] is the area of the cross section, plane, perpendicular to the direction of the air flow and v [m/s] is the velocity of the air, wind speed, passing the cross section.

The kinetic energy of the air is converted to the electricity by the rotors and the generator of the wind power turbine. As a result the air flow is slowed down and loads are introduced to the structure. The decelerating of the air flow starts at a distance approximately one rotor diameter in front of the turbine and is completed at the same distance behind the turbine. The amount of energy which is absorbed by the structure is governed by the degree of the deceleration, the rotor diameter, rotor structure and the rotational speed.

In the most efficient case the speed of the wind is reduced at the rotor to 2/3 of the speed corresponding to the undisturbed conditions, and to 1/3 after the rotor, [2]. This deceleration corresponds to 59 % usage of the wind power which is theoretically most optimal utilization of the wind power. However, it should be noted that because of losses such as frictions, vibrations, etc all energy can't be converted to the electricity, i.e. the obtained electric power is less than 59 % of the wind power.

The loads which are imposed on the structure when the turbine is producing power are also governed by the degree of the deceleration, the rotor diameter, rotor structure and the rotational speed. The imposed load is determined by the operational properties of the turbine.

The oscillation of the wind may also cause swinging of the structure which increases the load effect. Furthermore, the variation/distribution of the wind velocity in the vertical direction and turbulences my impose torque on the wind power turbine. As mentioned above even these load effects are governed by the properties of the turbine.

Although determination of the loads and load effects are not within the scope of this report, some issues will still be highlighted by means of the guidelines presented in [1].

A wind turbine is designed for so called external conditions. External conditions are dependent on the intended site or site type for a wind turbine installation. The most important design parameters are wind speed and the turbulence. Therefore the wind turbines are subdivided into wind turbine classes, which are defined in terms of wind speed, V_{ref} and V_{ave}, and turbulence categories *A* (category for higher turbulence intensity value) and *B* (category for lower turbulence intensity value). In addition to the wind turbine classes other

external conditions such as normal and extreme temperature ranges, humidity, air density, solar radiation, etc are defined.

According to [1] a plant shall be designed with regard to a reference wind speed V_{ref}, which is specified for a certain wind turbine class. A designed turbine shall withstand the environmental conditions in which the 10-min mean of the extreme wind speed with a recurrence period of 50 years at hub height is equal to or less than V_{ref}. Five turbine classes are defined, namely classes I – IV and S. The V_{ref} [m/s] for classes I – IV are 50, 42.5, 37.5 and 30. The wind speed for class S is specified by the manufacturer.

The mean wind speed V_{ave} is the annual average of the wind speed over many years. The V_{ave} corresponding to classes I – IV are 10, 8.5, 7.5 and 6.

The loads are calculated for design load cases, which are defined by ***Design situation***, ***Wind conditions***, ***Other conditions***, **Type of analysis** (ultimate limit state and fatigue) and ***Partial safety factor*** (Abnormal, normal and extreme).

34 design load cases are defined which are grouped in 8 principal groups as followed:

1. Power production
2. Power production plus occurrence of fault
3. Start-up
4. Normal shut-down
5. Emergency shut-down
6. Parked (standstill or idling)
7. Parked plus fault conditions
8. Transport, erection, maintenance and repair

The analysis is carried out for ultimate limit state and fatigue.

The resulting load effect on the each load bearing structural parts of a wind power turbine is governed by the properties/design of the rotor, the machinery, the tower and the ground structure. Especially, the properties/design of the rotor and the generator are decisive which the manufacturer has thorough knowledge about. Therefore, the loads imposed on the structure are normally delivered by the manufacturer. The loads imposed on the foundations are also normally delivered by the manufacturer.

2.3 Wind power turbine tower structures

The development of larger turbines and the development of higher towers to be able to capture the higher winds at larger heights has led to the development of different tower concepts as described in [3].

In the following some of the tower concepts are described.

2.3.1 Tubular steel tower

Most of the wind power towers are tubular steel structures. The reasons are: 1) the tubular steel structure is relatively light and due to its circular cross-section has the same bending stiffness in all direction; 2) it has god torsional stiffness; 3) the required natural frequency can easily be achieved for certain types of turbines and hub heights; 4) it is relatively easy to install and has low maintenance costs.

Development of turbines with higher maximum power, increased hub height and increased steel price has made the steel tower less economical. Increased hub height decreases the natural frequency of the structure. Furthermore, increased wind power, i.e. turbine power, increases the loads, bending and torsional moments acting on the structure. In order to withstand the increased loadings the dimensions of the tower must be increased, i.e. both diameter of the tube and the thickness of the plate, tube wall, must be increased, which lead to further implications.

One implication is the transportation, i.e. a diameter of 4 to 4.5 meter is usually the upper limit that can be transported to the most locations in land. The other implication is the weight of the segments. The weight of a 12 m long segment with 6 m diameter made of 30 mm plate is 53 tons, which can be difficult to transport in mountainous areas.

Apart from the difficulties associated with the transportation there are also production problems. Rolling of the plates thicker than 50 mm is difficult and the welding becomes labour-intensive. Tubular steel towers have been manufactured with hub heights up to 120 m.



Figure 2 – Tubular steel tower on reinforced concrete pedestal.

2.3.2 Lattice towers

A lattice structure is made of struts which are assembled in a specific order to obtain a prescribed structural strength and stiffness with as little material as possible. In comparison with other tower concepts the lattice towers are less material consuming. The steel is used most effectively and the weight of the tower is less than the other comparable concepts. Quite tall towers can be built by means of lattice system. Since, the towers can be assembled on site no transport difficulties will be encountered. As far as the traditional hub heights are concerned the lattice towers are the cheapest tower solution, provided that the maintenance costs are disregarded.

Maintenance is one of the major drawbacks of the lattice system. There are many joint bolts in a lattice tower, 10,000 in some case. Each bolt must be inspected three times during its service life, which is 20 years. The additional drawbacks of the lattice towers are associated with the towers stiffness and natural frequency. Although the problems can be remedied by increasing the number and the thickness of the elements, profiles, etc the problem can't be solved without increasing the size of the tower's cross-section. However, increased cross-sectional area leads to wider area in the base of the tower, i.e. wider foundation is needed. Furthermore, there are limits for the size of the cross-section at the higher levels. At the higher levels the position of the rotor is a decisive factor, i.e. the distance between the rotor and the tower must be sufficiently large in order to avoid a collision between the rotor and the tower.



Figure 3 - Lattice tower.



Figure 4 - A tubular and a lattice steel tower side by side.

2.3.3 Concrete tower

Pure concrete towers have been used for wind power plants in some cases. The number of towers made of concrete is much lower than the number of tubular steel tower. However, development of new efficient production techniques, increased number of sites, increased number of turbines per site and increased steel price has led to increased number towers made of concrete. For instance cast-in-place by slipform and prefabricated elements has frequently been used to build towers.

All concrete towers are made of reinforced concrete. Functionally two types of reinforcements are used, namely non-stressed (ordinary cast in reinforcement) and post-tensioned reinforcement. The first one is used to provide bearing capacity during production and erection of the tower while the latter is used to place the concrete cross-section in a state of compression before application of service loads. The advantages of the concrete towers are their stiffness, robustness and maintenance properties. A properly designed and produced concrete tower does not need any maintenance during the designed service life. Furthermore, concrete towers in a distant location may be easier and cheaper to produce than the steel towers.



Figure 5 – Towers made of prestressed cast-in-place and slipform cast concrete.



Figure 6 – Production of prestressed cast-in-place and slipform cast concrete.

2.3.4 Hybrid concrete and tubular steel towers

Large turbines and high hub heights require tower structures with high strength, stiffness and natural frequency. High base diameter and wall thick-

ness are demanded in order to fulfil the requirements. It has been shown that it is possible to meet above-mentioned requirements by means of concrete towers either alone or as a part of a hybrid structure.

A hybrid concrete and steel tower consists of concrete sections in the lower part and tubular steel sections on the upper part. For a given hub height the dimension - i.e. diameter, wall thickness and total length of the sections – of the concrete and the steel parts depend on many different factors, such as turbine capacity, wind conditions, logistic, etc. Different manufacturer provide different solution. Approximately 2/3 of a hybrid tower, with hub height 120 - 140 m, may be made of concrete and the remaining part made of tubular steel.

The structural concepts and the production techniques which are used for the concrete part of the hybrid concrete and steel towers are with a few exceptions similar to those of the concrete towers.



Figure 7 – Hybrid concrete and tubular steel tower.

3 Foundations for wind power on-shore

3.1 Principal types of foundations

The type and the size of the foundations used for the wind power turbines are governed by the geotechnical conditions of the site, the maximum power of the turbine and the type of the tower.

When the ground consists of soil with sufficient bearing capacity the loads from the wind power turbine are transferred to the ground by spread footing, i.e. slab foundation. The spread footings rely on soil bearing, and the weight of the foundation itself and the soil backfill on top of the foundation to resist tilting under wind loads.

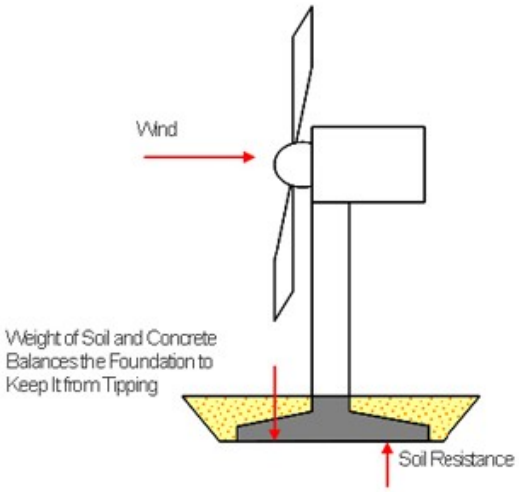


Figure 8 – Spread footing, from [4].

If the bearing capacity of the soil is not sufficient piling is required in order to increase the load bearing capacity of the foundation. The function of the piles are to support the footing and to transfer the loads to a more rigid ground, for instance to the bedrock. The tilting resistance of the foundation comes from the tension and compression resistance of the piles.

Spread footings on the bedrock can be anchored to the bedrock in order to eliminate the need for soil cover and take advantage of high strength rock at the surface.

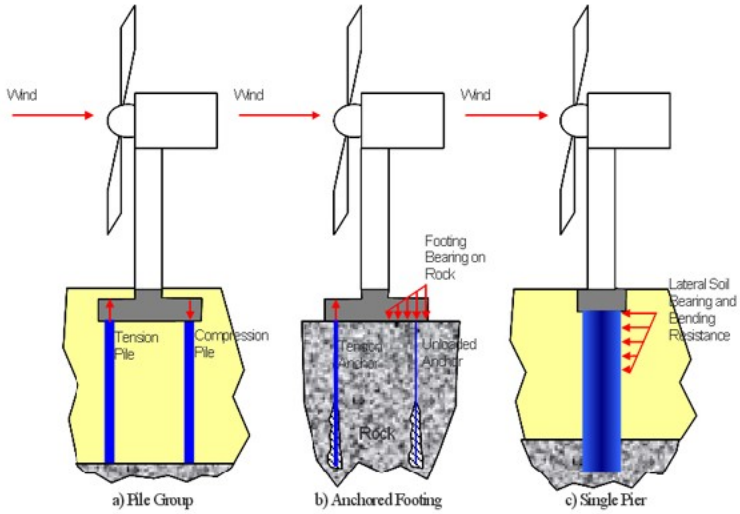


Figure 9 – Different foundations, a) spread footing supported by piles, b) spread footing anchored to the bedrock, c) Footing supported by a single, from [4].

Besides the lattice towers all towers are erected on a single footing. Since, the base of a lattice tower can be wide it is not structurally and economically efficient to erect the tower on a single footing. In practice each legs of a lattice tower is founded on a separate footing.

Recently many wind power turbines have been founded on the bedrock, Figure 9b. Although the number of the turbines founded on the bedrock is increasing still the major part of the Swedish wind power turbines have been founded on the spread footings on grounds/soils with sufficient bearing capacity. The number of the footings which are supported by the piles are not known for the author, but it is supposed that their number is limited.

3.2 Principles for foundations design

As it was mentioned in section 2.2 the loads imposed on the foundations are normally delivered by the manufacturer. Figure 10 shows the coordinate system of the tower bottom at the intersection of the tower axis and the upper edge of the foundation. The section forces which are considered in design are bending moments M_{XF} and M_{YF}, torsional moment M_{ZF}, horizontal forces F_{XF} and F_{YF}, and the vertical force F_{ZF}.

The structure of the foundation and the ground which supports the foundation is designed according to the national, or corresponding international, design codes.

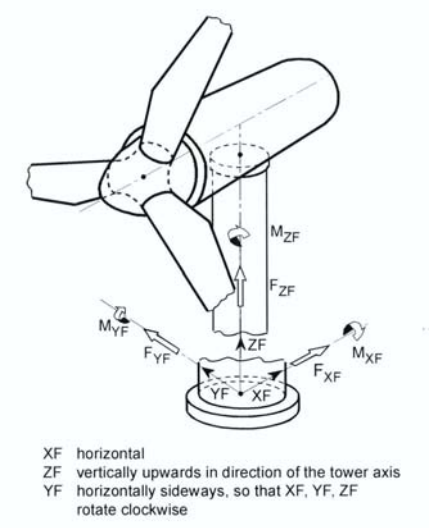


Figure 10 – Tower bottom coordinate system, from [1].

3.3 Structure of the foundation

3.3.1 General

As it is presented in section 2.3 there are different types of towers. The type of the tower may influence the design and the details of the foundation. For instance the transfer of the section forces from the tower to the foundation, i.e. the connection between the tower and the foundation, may influence the design and the shape of the foundation. There are great differences between the connection of a prestressed concrete tower to a concrete foundation and the connection of a steel tower to a concrete foundation. Since, this report deals with the damages observed in foundations for wind power turbines containing steel towers, only foundations supporting steel towers will be considered in the following parts.

Figure 11 shows a principle drawing of a spread footing foundation, which is used for 2 – 3 MW turbines. Nine major details are distinguished in the figure:

1. Soil
2. Concrete layer, representative concrete grade C25/30, thickness ~ 100 mm.
3. Spread footing, slab foundation, made of concrete (representative grade = C35/45) – representative values for L_1, L_2 and L_3 are 18 m, 1,6 m and 1,8 m respectively.
4. Pedestal made of concrete (representative grade = C35/45 or higher) - representative values for L_4 and L_5 are 0,6 m and 5,5 m respectively. This type of the pedestal should not be confused with that presented in section 4.3. The high pedestal, 4 to 8 m high, which is presented in section 4.3 is used in order to gain a significant increase in the hub

height. This type of design was, however, not commonly used in the past and it is almost abandoned at the present time. This design has not commonly been used in Sweden.

5. Top layer reinforcement, two layers of reinforcement in both X and Y directions, representative material Ø 25 mm B500B, Figure 18 and Figure 19.
6. Bottom layer reinforcement, two layers of reinforcement in both X and Y directions, representative material Ø 25 mm B500B, Figure 18 and Figure 19.
7. Shear reinforcement, Ø 25, Figure 18 and Figure 19 .
8. Steel adapter for connection of steel tower - representative value for L_6 is 4,8 m.
9. Thickening of footing for placement of flange for stud bolts. There also footings without this type thickening. In those footings the flange is placed above the bottom layer reinforcement, Figure 19 .

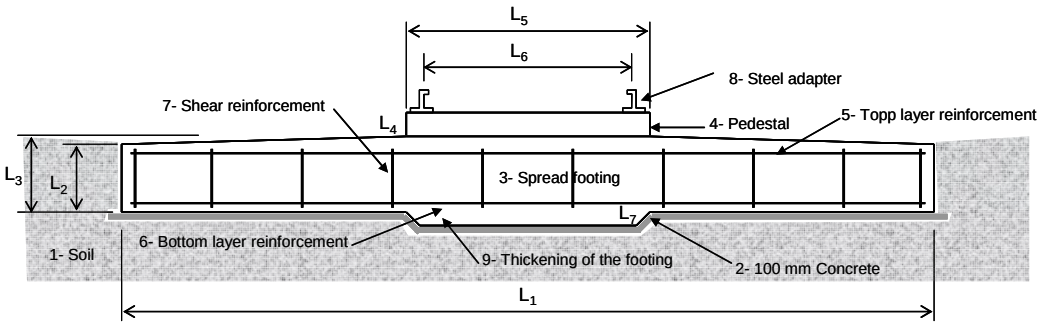


Figure 11 – Principle drawing of a spread footing foundation, vertical cross section.

The spread footings are made square, circular or octagonal. In square footings the bending reinforcements are placed in X and Y directions while in circular and octagonal footings the reinforcement are placed in radial direction.

One of the important parts of the wind power turbine is the connection of the tubular steel tower to the foundation. There are two different principal arrangements to connect the tower to the foundation, namely *insert ring* cast in the foundation and *steel adapter* fixed by stud bolts,

Figure 12. In this context should be noted that principally the same connection methods are applied for footings founded on the bedrocks.

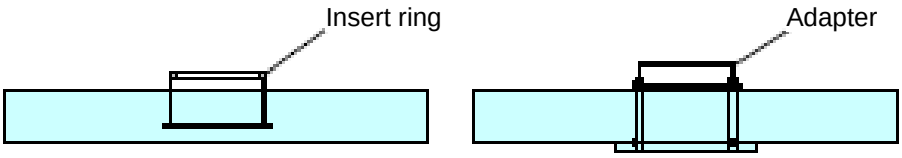


Figure 12 – Different types of arrangements for connection of the tower to the foundation, [5].

3.3.2 Insert rings

In the beginning of the wind power era a great number of the towers were connected to the foundation by means of the insert ring. Because the insert ring was easy to put in place and to adjust Since, at that time the maximum power and the height of the towers were small the loads which were transferred to the foundation did not introduced stresses in such a magnitude to damage the foundation structure. However, development of larger wind power turbines has led to higher stresses in connection devices and the concrete structure of the foundation which have damaged the structure. In order to avoid the damages new types of connections and detailing have been developed. The author has no access to the design of the different foundations with insert rings, which have been used since the early ages of the wind power turbines. Neither has the author access to the designs which have damaged to the foundation result. Therefore, the author will not try to describe the development of the design of the foundations with the insert rings and to point out the designs which have damaged the foundations. However, a few designs which have led to damaged foundations are described in section 4.4.

The design of the foundations with insert rings has been improved since the short comings of the original design were revealed. At the present there are different designs for foundations with insert rings. Although it is out of the range of this report to present different designs, some designs will be presented in order to illuminate the subject and show different detailing.

Figure 13 shows an insert ring embedded in concrete foundation and the detailing around it. As can be observed there is a flange in the upper part of the ring where the tower will be mounted. There is another flange in the lower part of the ring for fixation of the ring and to transfer the tensile and compressive forces from the tower to the foundation. It should be noted that the author is not aware of any damages concerning the foundations build according to the design shown in Figure 13.

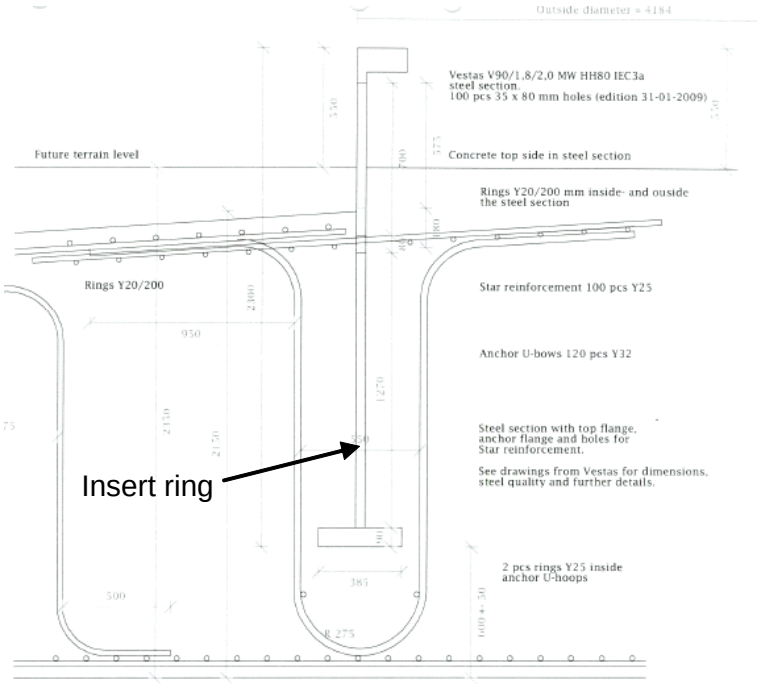


Figure 13 – Insert ring embedded in concrete foundation, [6]. The original drawing is shown in Appendix 1.

Between the flanges the ring contains holes through which the reinforcement bars pass, Figure 14. Please not that the insert ring in the Figure 13 doesn't refer to the ring shown in the Figure 14. According to the design requirements the reinforcement bars shall not be in contact with the ring. Therefore the part of the reinforcement bar which passes through the hole is covered by sealant or other type of material to prevent connection/contact between the bar and the ring.

As mentioned above, connection by insert ring occurs in different designs. The insert ring shown in Figure 13 differs from the designs from the early age of the wind power turbines. In the design shown in Figure 13 the concrete is protected against cracking by means of the U-hoops, reinforcement rings inside and outside of the steel section and the reinforcement rings inside anchor U-hops.

Figure 15 shows another design in which the cracking of the concrete is prevented by means of prestressing arranged by the stud bolts mounted around the ring.



Figure 14 – Insert ring with holes through which the reinforcement bars pass.

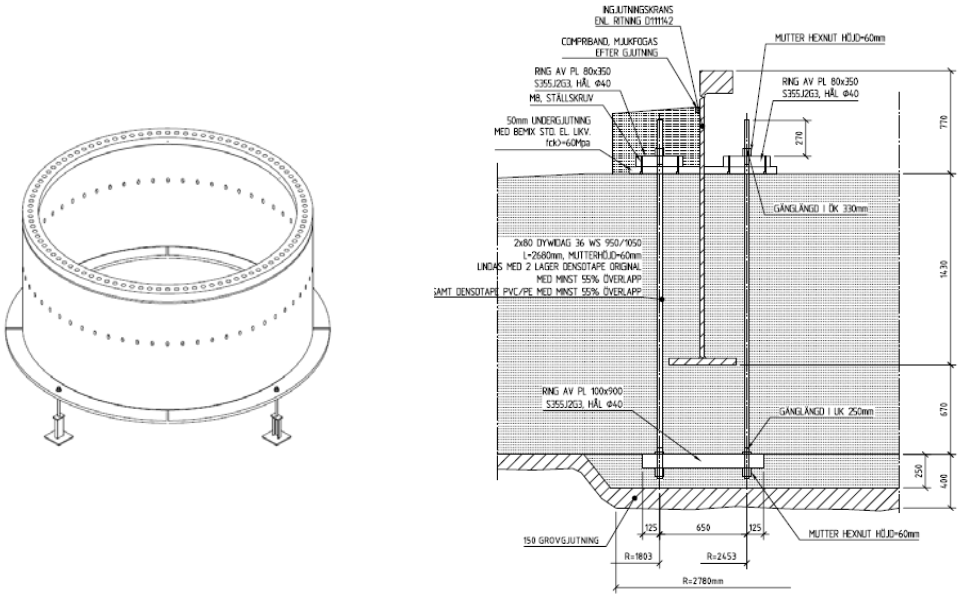


Figure 15 – Insert ring (left) and detailing around insert ring in concrete foundation (right), [8]. The original drawing is shown in Appendix 2.







Repair of concrete around insert ring. The reinforcements, which pass through the insert ring shall be not in contact with the insert ring. The reinforcement is isolated from the ring by sealant.

Figure 16 – Repair of concrete around insert ring, [9].

3.3.3 Connection by means of adapter

Figure 17 and Figure 18 show another type of connection arrangement. As can be observed the connection consists of an adapter which is fixed to the foundation by means of the stud bolts. The stud bolts are in turn fixed in the structure by means of a flange in the bottom of the foundation. As mentioned above in some cases the bottom flange is placed under the reinforcement and in some other over the reinforcement, Figure 19. The stud bolts are not in contact with concrete. The studs are covered when cast in concrete.

Figure 20 shows another design regarding connection by means of anchor bolts. In this design the bottom flange is not placed in the bottom of the foundation but in the upper part, i.e. within the pedestal.

In some designs the adapter is replaced by a load spreading plate. The approximate dimensions of the plate are thickness = 75 mm, width = 700 mm, outer ring diameter = 5000 mm. The plate is placed approximately 70 mm above the planed concrete surface before concrete is cast, Figure 21 and Figure 22. When the concrete is hardened the plate is levelled and fixed and the gap between plate and the hardened concrete is grouted by a high strength mortar. The tower is mounted by placing the tower flange on the load spreading plate and anchoring the flange to the foundation by the cast in stud bolts.

Appendix 5 shows an example of a foundation on bedrock.

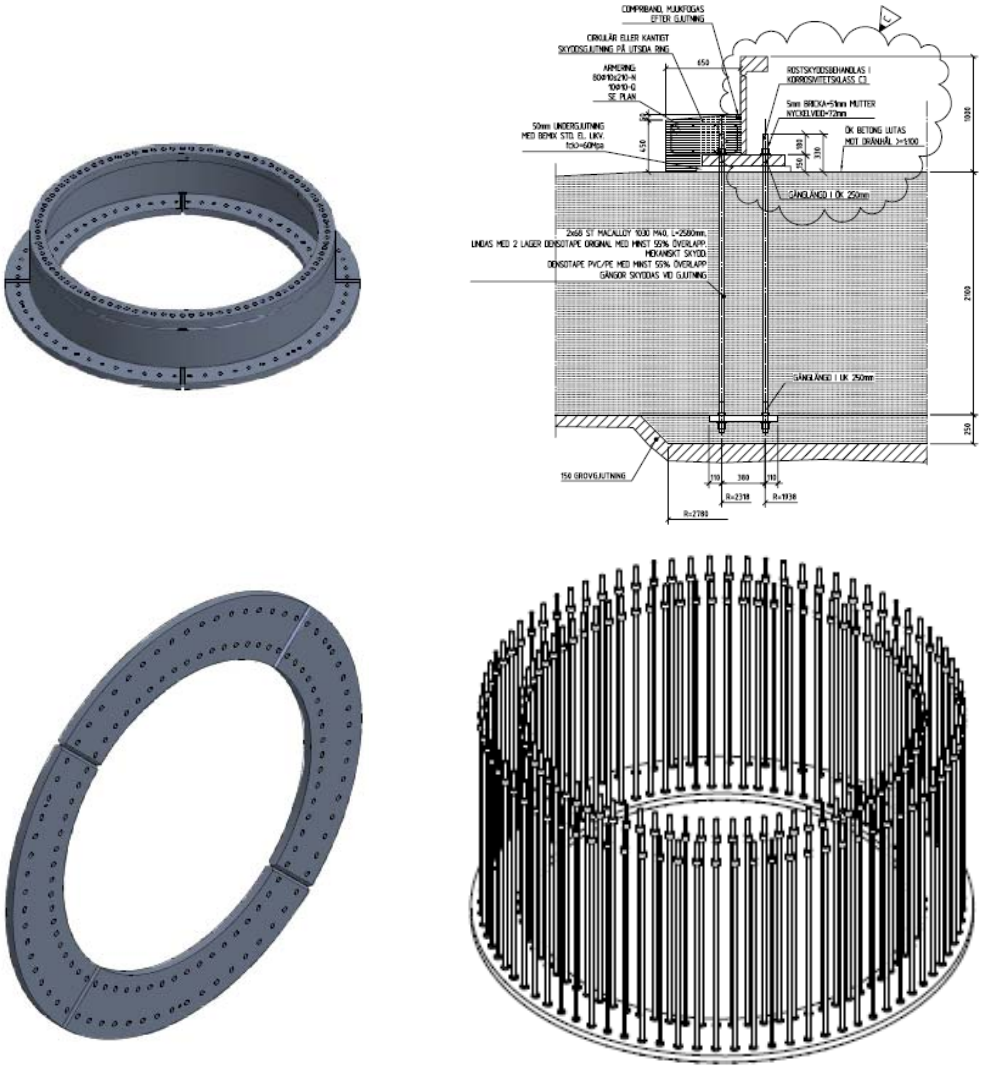


Figure 17 – Stud bolt foundation steel adapter (upper left), detailing around insert ring in concrete foundation (upper right), fixing flange and stud bolt, [8]. The original drawing is shown in Appendix 3.

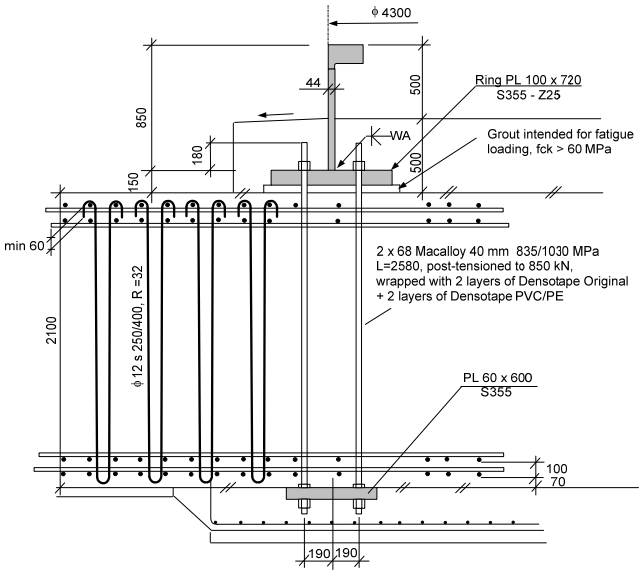


Figure 18 – Adapter and prestressed anchor bolts, [8].

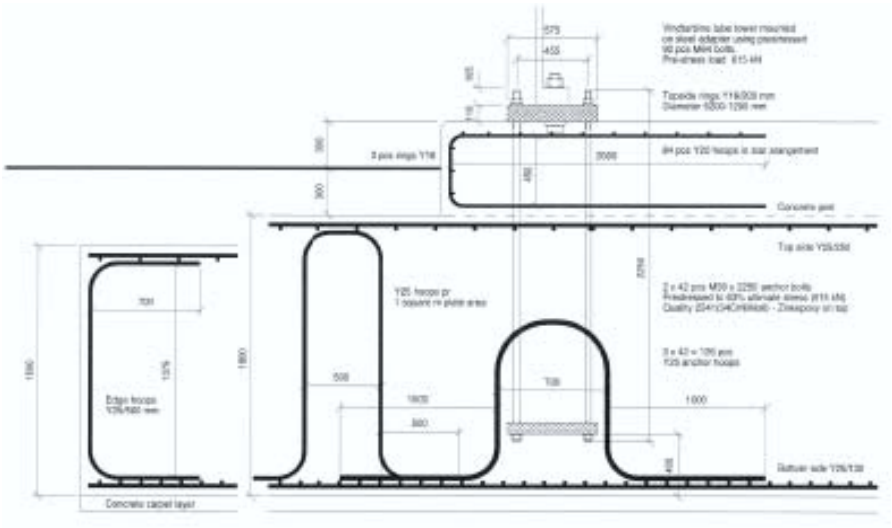


Figure 19 – Steel adapter, anchor bolts with lower flange placed over the reinforcement, [10].

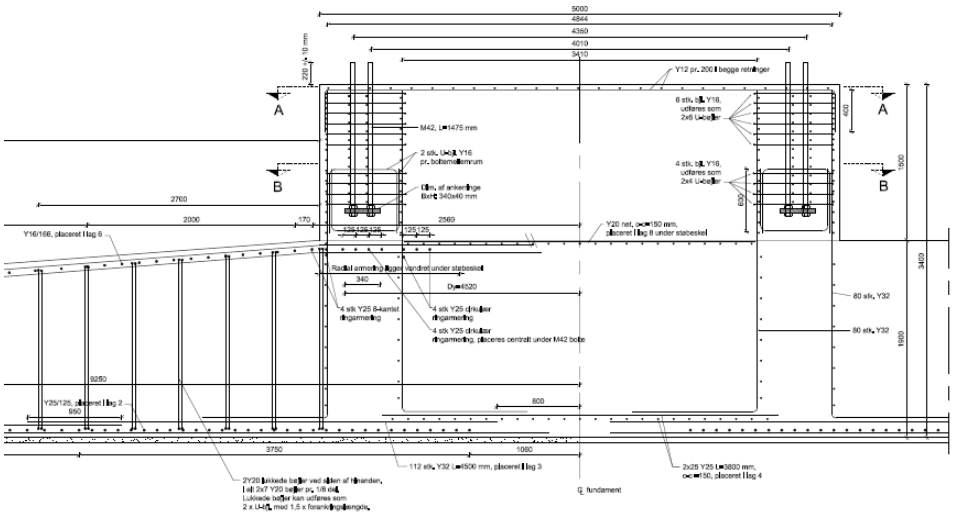


Figure 20 – Connection by anchor bolts with a lower flange in the pedestal, [11]. The original drawing is shown in Appendix 4.



Figure 21 – Flange on the top of the pedestal before casting.



Figure 22 – Flange on the top of the pedestal after casting.

3.4 Construction

The construction of the foundation is briefly described below. It should be noted that the sequential description below is generic and applies for both foundations containing insert ring and foundations containing stud bolts. The principal differences are however pointed out. Furthermore, it should be noted that the details presented in the following figures are not associated with the designs presented in sections 3.3.23.3.3 and 3.3.3.

After excavation the bottom concrete layer is cast. After that the bottom layer and edge reinforcement is placed. The insert ring or the stud bolts are installed before upper layer reinforcement and shear reinforcement are mounted, Figure 23. When all installations are down the concrete, is poured into the form, Figure 24.

Foundation surface is sloped to drain the water from the surface. The slope is achieved by pouring more concrete in the central part of the foundation and then smooth down the surface towards the edges, Figure 25.



1- Bottom concrete layer



2- Bottom reinforcement



3- Bottom and edge reinforcement



4- Insert ring



5- Stud bolts and bottom ring



6- Stud bolts and upper ring

Figure 23 – Different production steps, 1-4 [12] and 5-6 [10].



Figure 24 – Pouring of concrete in a prepared spread footing formwork, [13].



Figure 25 – Trowelling of the surface and covering the surface by plastic foil to prevent drying during curing, [13].

There are great stresses transmitted from the tower to the foundation through a small surface of the flange of the steel adapter or load spreading plate. Therefore, a high flatness of the concrete surface where the adapter flange or load spreading plate is in contact with the concrete is required. An uneven and non-flat surface results in large stress concentrations, which may crush the concrete.

There are two ways to achieve a flat contact between the concrete and the flange or the plate. The first way is that the adapter is mounted a bit above the concrete surface and then the gap between the flange and the concrete is injected with a high strength mortar grout, see Figure 32. The other way is to press the adapter or the plate into the concrete while the concrete is fresh. In this way produces a footprint in the concrete which provides a flat contact between the concrete and the flange.

4 Cracks and damages in foundations for onshore wind power turbines

4.1 General

A comprehensive family tree of crack types is shown in Figure 26, [14]. All types of cracks presented in the figure are possible to occur in wind power turbine foundations as well as any other structure made of concrete. However, most of the cracks can be avoided by means of careful design, choice of material, workmanship, construction, etc.

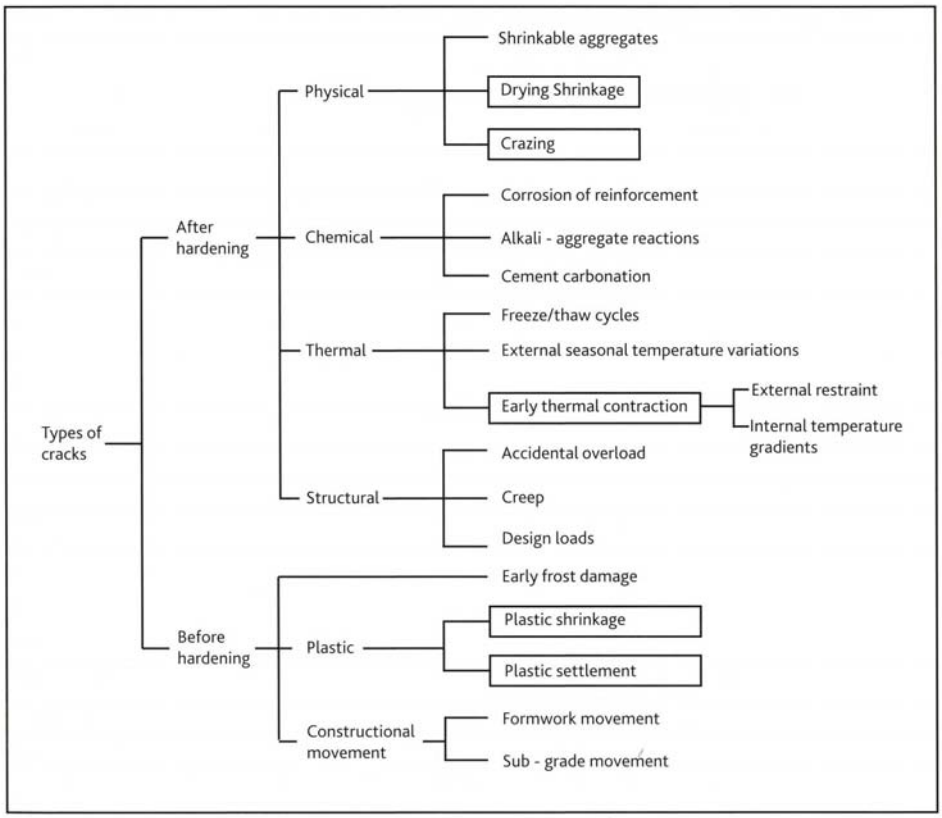


Figure 26 – Types of cracks, [14].

Different types of cracks in concrete foundations for wind power turbines have been reported. Most of the damages that the author has knowledge of have

been caused by design faults, please refer to [15], [16], [17], [18], [19] and [20]. Other non-structural cracks are according to [15] caused by:

- Insufficient concrete cover
- Improperly installed reinforcement
- Inadequate concrete curing
- Concreting at low temperatures
- Concrete mix is not correct, water is mixed at the construction site
- Casting joint show cracks or defects

Some cases which have been addressed in [15] will be described next.

4.2 Mortar grout between the steel flange and the foundation

The steel tower is connected to the foundation by means of pre-stalled anchor bolts.

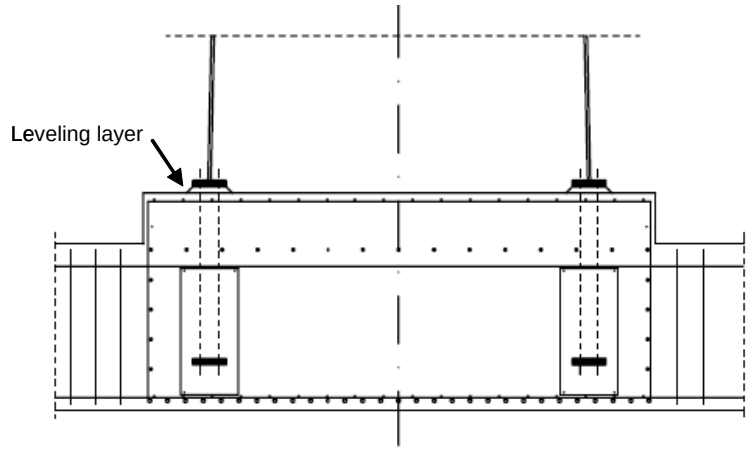


Figure 27 - Connection between the steel tower and the foundation, [15].

As it can be observed in Figure 27 there is a levelling layer of high-strength mortar grout in the transition zone between the steel plate of the tower and the concrete surface, see also Figure 32. The function of the mortar grout is to withstand the compressive forces from the tower and distribute it on the concrete surface. Therefore, flatness of the concrete surface, contact area and the bonding between the concrete and the mortar, the strength of the mortar and the contact area between the mortar and the flange are important factors in this context.

When mounting, the tower segment is first placed on three contact elements followed by the alignment of the segment. After alignment the mortar is

poured inside the space between the concrete surface and the flange of the segment. The anchor bolts are tightened when the mortar has been hardened.

There are sometimes problems such as:

- Shrinkage cracks
- Excess material at the edge
- Lack of strength due to processing at low temperatures
- Voids between the concrete and the tower segments due to insufficient injection of mortar grout.

The first two problems are actually harmless. However, the two other problems require some remedial actions to be taken, which may necessitate the replacement of the mortar grout.



Figure 28 - Vertical shrinkage cracks, [15].



Figure 29 - Side excess material, [15].

Some other damages associated with the defect mortar grout are reported by [9], for instance: soft layer due to separation in mortar, air inclusion inside the mortar and below the flange and non-uniform grouting material.

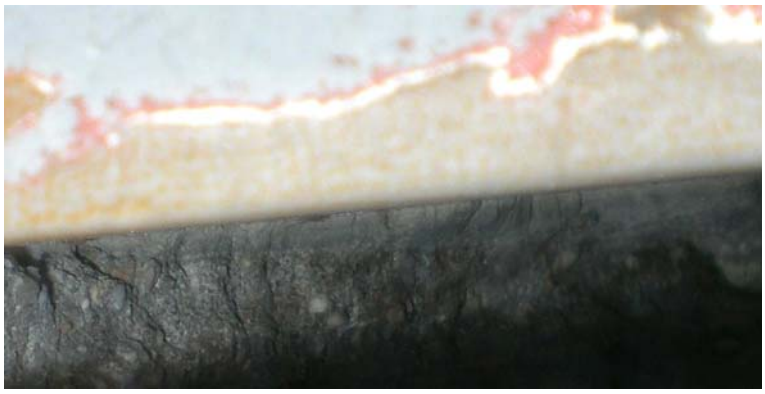


Figure 30 – Weak mortar grout caused by separation of the mortar, [9].



Figure 31 – Inclusion of air voids inside the mortar grout under the flange, [9].



Figure 32 – Two different mortar grouts are used, [9].

4.3 Cracks in concrete foundation pedestal

The foundation pedestals may be divided into two groups, namely “short pedestals” and “high pedestals”. This subdivision is not commonly used, but it is used in this report in order to distinguish between to types of structures. The author has no data about the height of different pedestals used in praxis. The height of the short pedestals which the author has been observed in different drawings is normally lower than 1 m. The height of the high pedestals, which are considered in this report, is about 4 to 8 m. It should be noted that the type of cracks which are described below refers to high pedestals. The author has no information about the similar cracks in short pedestals.

A foundation type which is used, mainly in Germany, to achieve a significant increase in the hub height, and energy production, was steel towers mounted on the foundation pedestal [15]. The solution was a circular pedestal of about 4 to 8 m height on the existing foundation. The wall thickness of the pedestal was approximately 1 m in order to have enough space for the bolts or wires for mounting of the steel tower. The steel tower can be mounted either by wires or by the pre-stressed anchor bolts. This type of structure shows many cracks, which generally are horizontal. The crack widths are not negligible, where as many of them are even larger than 0,4 mm.



Figure 33 - Cracks in the reinforced door area, [15].

The occurrence of the cracks may be explained by the fact that the concrete foundation is designed with regard to the ultimate limit state and not for the serviceability state. It is possible that the stresses caused by the loads at serviceability state in combination with the thermal stresses have caused the cracks. It should be noted that during the winter, the inside of the structure is warmer than the outside, since the operating system inside the tower produce heat. In the summer, however, the outside of the structure is warmer due to the solar radiation. Please consider the stress/strength analysis provided in [15].

It has been observed that the cracks go through the structure. As the Figure 34 shows the crack leads in water and dirt from the outside to the inside of the structure.



Figure 34 – Cracks on the concrete pedestal inside the structure, photo Hassanzadeh 2011.

4.4 Cracks in foundations with insert ring

The tower of the wind turbine is connected to the foundation by means of a ring/tube partially inserted, cast-in, in the foundation. The inserted ring contains a T-flange at the bottom, the inserted part, and an L-flange at the top. The T-flange anchors the tube to the concrete foundation while the L-flange is for mounting the tower. There are also insert rings with two anchoring flanges. The second flange is placed on the upper part of the ring close to the surface of the concrete.

Both types of construction have caused cracking in concrete foundation. The mechanisms causing the cracks have been discussed in [15], [16], [17], [18], [19] and [20]. The mechanisms that cause the cracks will be presented in sections 4.4.1 and 4.4.2, which are entirely based on [15].

4.4.1 Insert ring with single anchoring flange

Figure 35 shows an insert ring with single anchoring flange. As it can be observed the inserted ring contains a T-flange at the bottom and a L-flange at the top. The T-flange anchors the tube to the concrete foundation while the L-flange is for mounting the tower.

A fundamental difficulty concerns the reinforcement on the upper part of the foundation. The reinforcement must be threaded through the holes in the wall of the insert ring, and shall not be in contact with the steel.

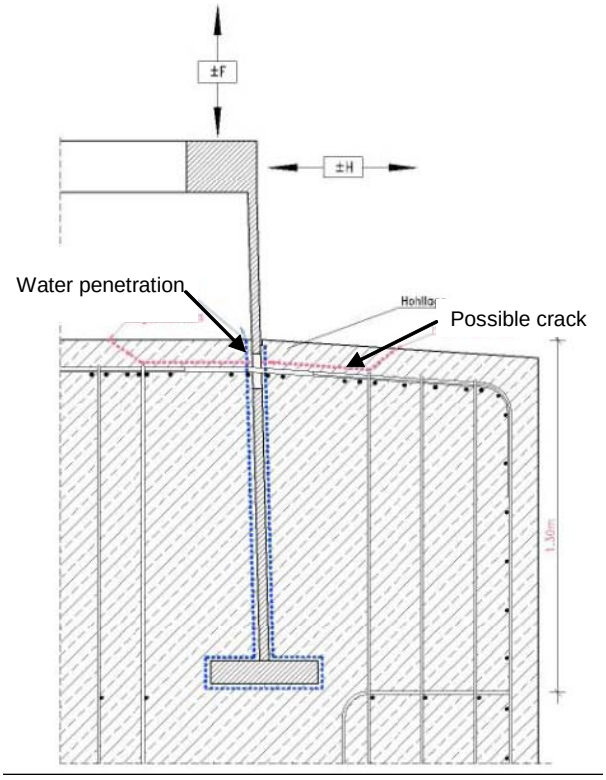


Figure 35 – Damages within the transition areas, [15].

In smaller wind power turbines this type of connection has functioned satisfactorily. In large wind power turbines, however, this solution has caused some concerns regarding cracking and de-bonding. The mechanisms behind the damages, Figure 35, are described below:

- Strains in the steel tube due to the loading lead to differential displacements between the tube and the concrete. The result is formation of a gap between the tube and the concrete.
- The horizontal displacements of the tube lead to stresses in the concrete cover which can't be resisted by the reinforcement. The stresses may lead to cracks in concrete cover and spalling of the cover.
- The horizontal forces also lead to small horizontal displacements/gaps which may increase displacements/movements of the upper part of the tube.
- The gaps and the cracks between the concrete and steel tube lead water. A flow of water around the insert ring and through it's holes will be induced due to the pumping effect caused by the alternating loads and displacements. The flow of the water may lead to leaching of the concrete and the mortar in the transition zones between the insert ring and the concrete.

Some damaged wind power turbines were inspected by means of the endoscopes. The results showed that the wash outs as wide as 3 mm had occurred between the concrete and the insert ring, and between the concrete and the anchoring flange. As a result the tight fit of the inserted ring and the concrete had been loosened. The movement of the ring relative to the concrete was clearly visible.

4.4.2 Insert ring with double anchoring flanges

Figure 36 shows an insert ring with two anchoring flanges cast in the concrete. The assumption made for the load sharing for the design considers the actions of the anchoring flanges separately, i.e. the upper flange transfers the compressive forces while the lower flange transfers the tensile forces to the concrete foundation, Figure 37.

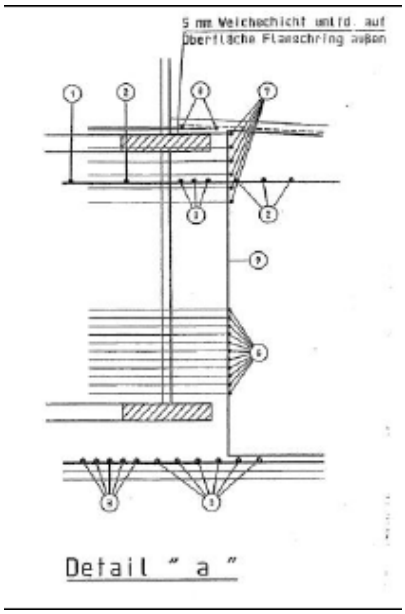
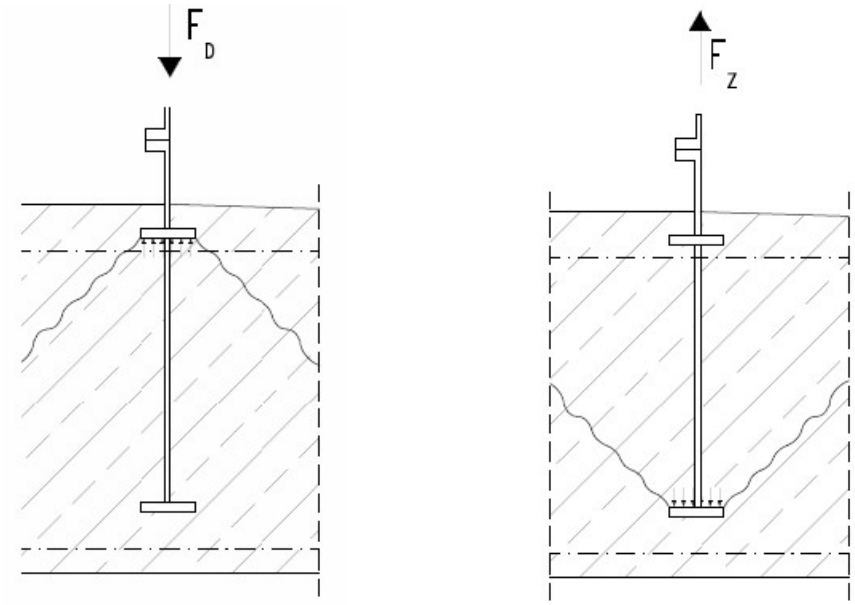


Figure 36 – Insert ring with double anchoring flanges, original details of an existing wind power turbine, [15].



a) b)

Figure 37 – Assumed model for transfer of the compressive (a) and tensile (b) forces, [15].

The assumptions made in the design model consider only the limit state bearing capacity and doesn't regard the structural behaviour in the serviceability state. The model doesn't account for the strains, extension and shortening, of the ring.

The change of the length can be determined as follows:

With the assumption that the stress, σ, and the modulus of the elasticity, E, are *105* N/mm² and *210000* N/mm² respectively the strain can be calculated as follows:

$\varepsilon = \sigma/E = 105/210000 = 0{,}5 \cdot 10^{-3}$

With the assumption that the length of the inserted part of the steel tube is *1000* mm, the length change of the ring will be *0,5* mm.

Due to the strains in the steel, the upper steel plate is pressed against the concrete cover. The concrete cover can't withstand the pressure and cracks as a result, Figure 38. The cracks are initiated on the upper edge of the anchor plate with 45 - 60 ° inclination and continue towards the surface of the foundation to emerge on the surface as concentric rings parallel to the tower wall, Figure 39. The pulling force thus leads to the movement of the upper plate, and cause the cracking at the upper edge of the foundation.

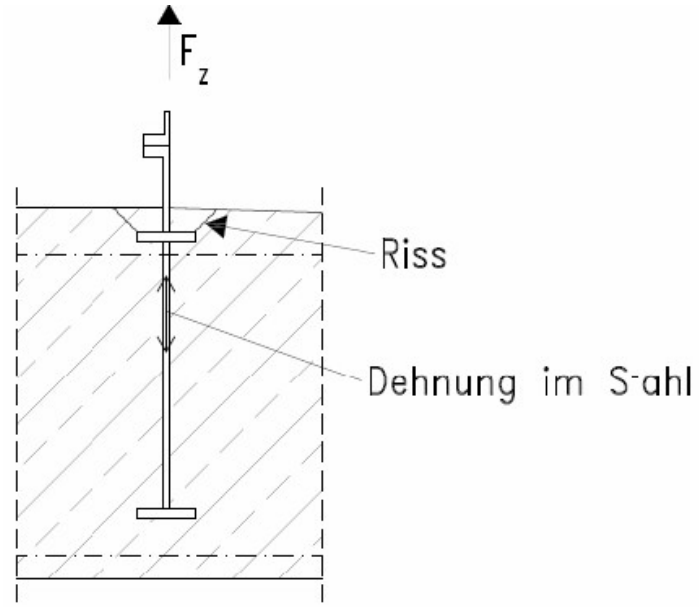


Figure 38 – Actual structural behaviour (Riss = Cracks, Dehung im stahl = strains in steel), [15].



Figure 39 – Significant crack approximately 35 cm from the tower, [15].



Figure 40 - Spalling (s) due to the cracks, with out-flowing water, [15].

The question is what happens in the case of the compressive forces? In general, the compressive forces are transferred by the shell of the ring to the lower flange and the concrete beneath the flange. The question is whether the upper flange carries any load or not. There is evidence suggesting that the compressive forces are in fact transferred to the flange at the bottom of the ring. Since the thickness of the foundation, concrete, under the flange is small it can't withstand the compression induced by the flange. It will crack in the same way as the upper part of the foundation above the upper flange as it is shown in Figure 41.

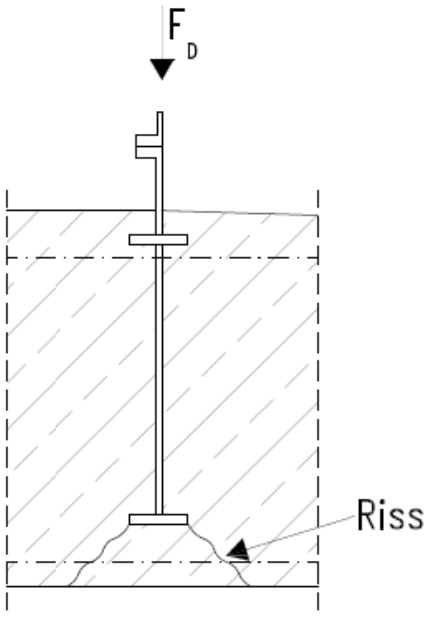


Figure 41 – Cracking caused by punching, [15].

The foundations of two wind power turbines were core-drilled. The drilling was carried out through the height of the foundations. As it was feared the punching cracks, as described above, were observed at the bottom of the foundation, Figure 42.



Figure 42 - Crack approximately 30 cm from the bottom of the foundation, [15].

Since the described damage type has frequently been observed, more detailed investigations were initiated.

Theoretically three mechanisms may cause vertical sliding between concrete and the ring. The mechanisms are as flowed:

- Extension of the steel wall due to tensile stresses
- Compression of the concrete between the steel flanges
- Shrinkage of the concrete between the steel flanges

The above-mentioned mechanisms may together cause 2 mm vertical sliding.

The sliding may be increased by other factors such as:

- Insufficient placing and compaction of concrete may cause that voids be formed under the flanges as well as between the steel ring and the concrete.
- Bleeding and separation of the components of the fresh concrete may create weakness zones below the upper flange.
- Cracks under the bottom flange caused by the compressive forces may disable the concrete to fully support the inserted ring.

Extensive assessments of various wind power turbines have been carried out. The sliding between the inserted tube and the concrete has been measured. The estimated sliding was within the range of 1 to 2 mm, which was also gen-

erally observed. However, in some cases much higher sliding were observed. In some cases 3 – 5 mm sliding was measured between the inserted ring and the upper part of the foundation. Sliding greater than 10 mm was also measured in some individual cases.

The observations reported by others are briefly outlined below:

- Cracks go from the upper anchor flange to the surface of the foundation as well as from the lower anchor flange to the bottom surface of the foundation.
- The insert ring de-bonds from the concrete and gaps are formed between the steel and the concrete.
- The insert ring is due to the above-mentioned mechanisms detached from the rest of the foundation. The forces are transferred through the dowel action of the reinforcements located in the top and the bottom of the foundation. Consequently it worsens the conditions.
- Due to the detaching there will be less weight available inside the foundation to balance the tensile forces.
- The anchorage is mainly brought about by the upper flange.
- Due to the bending the flange will be loaded unevenly resulting into bending stresses in the weld between the flange and the steel ring. The weld may fail due to the stresses, which leads to the failure of the structure.

4.4.3 Consequences of cracking

Water leaks into the foundation and around the reinforcement through the cracks at the top. Furthermore, the water may find its way to the lower parts of the foundation through the gaps and cracks between the insert ring and the concrete. The consequences are leaching of concrete, frost damage and reinforcement corrosion.

Only a very careful covering of the cracks and formation of a resilient groove in the transition between steel and concrete may be a suitable remedial action. However, the fundamental problem still remains.

The cracks at lower part of the foundation are not accessible. There may be risk for corrosion. The conditions for the corrosion to take place are that there must be electrolyte, oxygen and corrosion potential. All conditions are fulfilled. However, the reinforcement is protected by the alkalinity of the concrete. The protection of the reinforcement will be ceased either by the carbonation of the concrete or by ingress of chlorides. The carbonation of concrete is not possible due to high humidity and lack of CO_2. If the soil contains chlorides the reinforcement will corrode if the chloride concentration around the reinforcement reaches the threshold value. Furthermore, if cracks are wide the alkalinity in the cracks may be too low for the protection of the reinforcement against the corrosion.

5 Conclusions

As it is described in section 1 there are many perfectly designed wind power turbine foundations, which are not cracked and fulfil all functional requirements. However, there are foundations that have been cracked in such a way that they do not fulfil the requirements with regard to service life and structural stability. It was the aim of this investigation to determine whether the cracking of the foundations is a rare phenomenon or not. If not what are the causes, in which way they may influence the structural behaviour of the wind power turbines and how the cracks can be prevented. This report, by support of the referred sources, shows that cracking of the wind power turbine foundations is an issue which must be taken seriously. The report shows that the connection of the tower to the foundation by means of insert ring may lead to cracking of the concrete and formation of gaps between the concrete and the insert ring. Although the damages have no immediate consequences on the bearing capacity of the structure, they compromise the serviceability and long-term behaviour of the structure.

It has been pointed out that the main reason for the observed damages has been poor structural design, i.e. the solutions which were developed for smaller facilities, sometimes without thinking about possible consequences, have been applied to the larger wind turbines. Furthermore, the site investigations were not conducted properly and the findings were not brought back to the design praxis.

Besides the above-mentioned damage type two other types of cracking has been observed. One type is the cracking of the mortar grout between the connection flange and the concrete foundation. This type of cracking is caused by poor workmanship performance and inappropriate material selection. The other type observed is the cracks in the high pedestals, i.e. pedestals with a height of about 4 to 8 m. The cracks are caused by poor structural design. It should be noted that foundations with high pedestals were used in order to gain higher hub heights. This type of design was, however, not commonly used in the past and it is almost abandoned at the present time. This design has not commonly been used in Sweden.

However, cracking of the pedestal type which is described in this report indicates that the design praxis and guidelines should be further developed. As it is pointed out in [15] the serviceability state has been neglected in design of the pedestal. The reason may be that the manufacturers of the turbines deliver the failure loads, which are used to design the structure at the limit state, while the serviceability state design which includes determination of displacements, vibrations, crack risks etc is neglected. Moreover, cracking of the pedestal shows that tall concrete structures subjected to dynamic loads should be prestressed. It should be noted that this type of structure is not common in Sweden.

As mentioned earlier in the report there is another method for connection of the tubular steel tower to the foundation. The connection consists of a *steel adapter* which is fixed by stud bolts cast in concrete. The author has not en-

countered any report or article on the cracking of foundations containing steel adapter. Neither of the persons who the author met was aware of any damage cases involving foundations containing steel adapters.

Like any other reinforced concrete structures subjected to bending moment the spread footing foundations contain cracks. Although the cracks are unavoidable in these structures their size can be limited by means of careful detailing and design. The author has not found any guidelines which deal with detailing and design of the foundations, i.e. there is no organised dissemination of the knowledge regarding design of foundations for wind power turbines. Consequently, due to the lack of knowledge the number of damage cases may increase with an increasing number of wind turbines built.

6 Proposal for future research

6.1 Background

This report deals with the results of the phase 1 of a two phase project. The original overall aims of the project (both phases included) were to:

- document the failure process of cracking wind turbine foundations from examples in Germany and Denmark,
- determine types and causes of the cracks,
- develop guidelines for inspection, assessment and analyses in order to determine the causes of the cracks and
- develop guidelines for design and detailing of the foundations for the land based wind power turbines in Sweden in order to avoid cracks.

It was decided that research contents of the phase 2 should be determined after completion of the phase 1. The aims of the phase 1 were as followed:

- State-of-the-art report which includes type of foundations used for different types of towers and ground conditions, types of connections between towers and foundations used for different types of tower solutions, loading conditions, design basis, etc.
- Site visit and documentation of the observed cracks and the structural information.
- Preliminary analysis in order to describe the cause of the cracks
- Suggestions for a detailed study.

This report presents results of the phase 1. The last item in the list presented above will be presented in the next section.

6.2 Proposal for principal research direction

The remaining aims of the project, which concerns phase 2, are to:

- develop guidelines for inspection, assessment and analyses in order to determine the causes of the cracks and
- develop guidelines for design and detailing of the foundations for the land based wind power turbines in Sweden in order to avoid cracks.

It is still important to perform both project elements that are presented above, but with some changes. Below the contents/aims of the subsequent parts of the project are described in general terms.

- Development of guidelines for planning and production of wind power turbine foundations.

- Development of guidelines for production and quality control, inspection and damage assessment.
- Development of guidelines and handbook for repair of damaged foundations.
- Development of guidelines for design and detailing of the foundations for the wind power turbines.
- Evaluate the effect of cracks and damages on structural behaviour of the integrated response of the tower, foundation and ground, by means of experiments and numerical simulation.

The first four bulletins can be written based on the current knowledge and should developed by a group of experienced personnel where knowledge from other fields will be included where applicable.

The last bulletin requires integrated and long-term resources and it is therefore recommended that a PhD-project should be started. As mentioned elsewhere in the report the turbine manufacturers have profound knowledge about the wind power turbines. Since, the knowledge is not in the public domain it is difficult to compile a state-of-the-art regarding the level of the knowledge. For an individual who is not co-operating with a manufacturer it is difficult to find thorough studies regarding structural behaviour of wind power turbines. The structural behaviour is defined here as the integrated response of the tower, foundation and ground to the loads generated by the rotor and the generator. Numerical modelling should be applied together with measurements and experimental verification in order to understand the structural behaviour of the wind power turbines, towers, foundations, connections and other details. The generated knowledge will promote developments within the field of the wind power turbines. The knowledge and results from this suggested PhD-project has the aim to improve the design and detailing and also on repair of damaged wind power foundations and it is possible that the project initiate further development of the guidelines that are suggested above.

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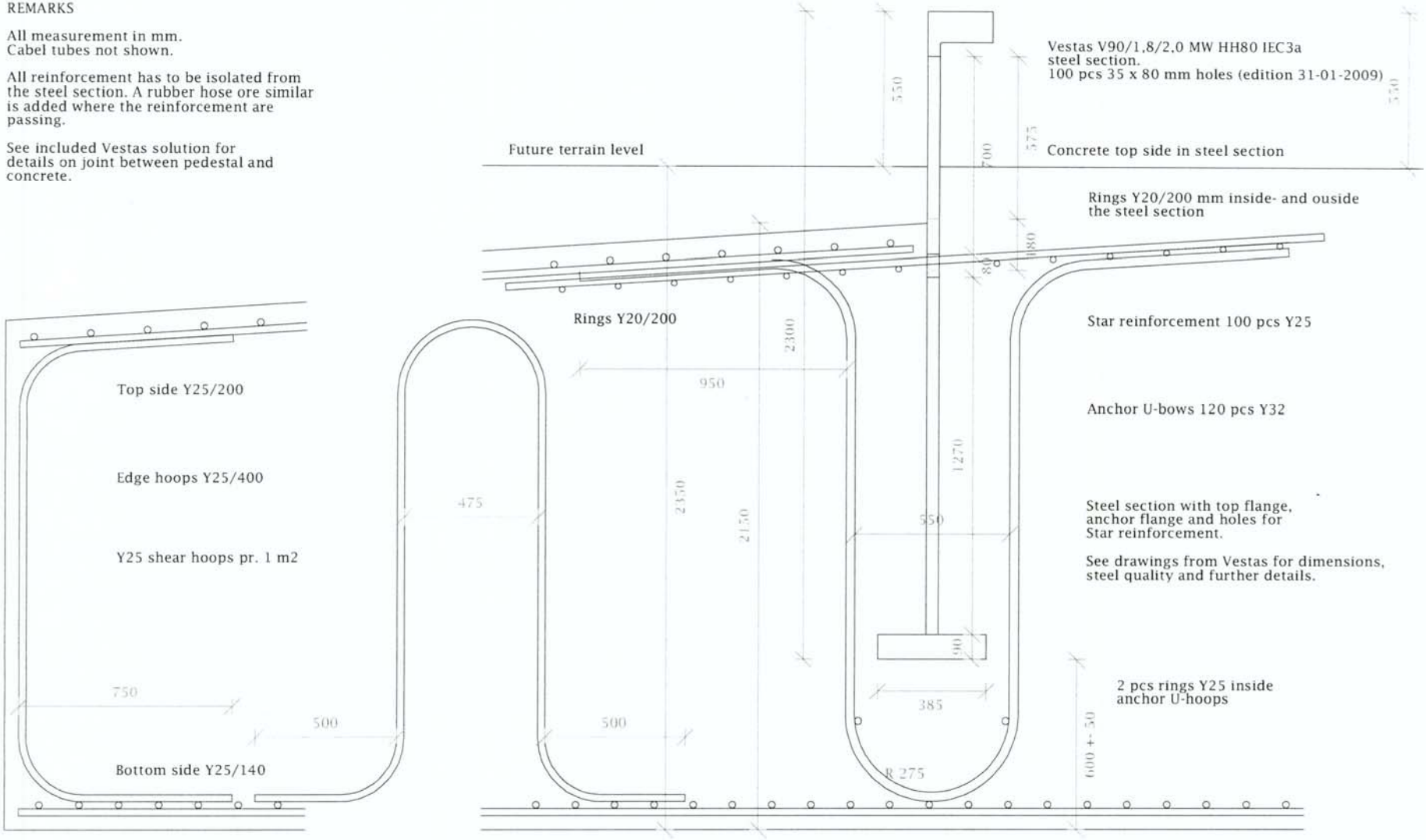
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REMARKS

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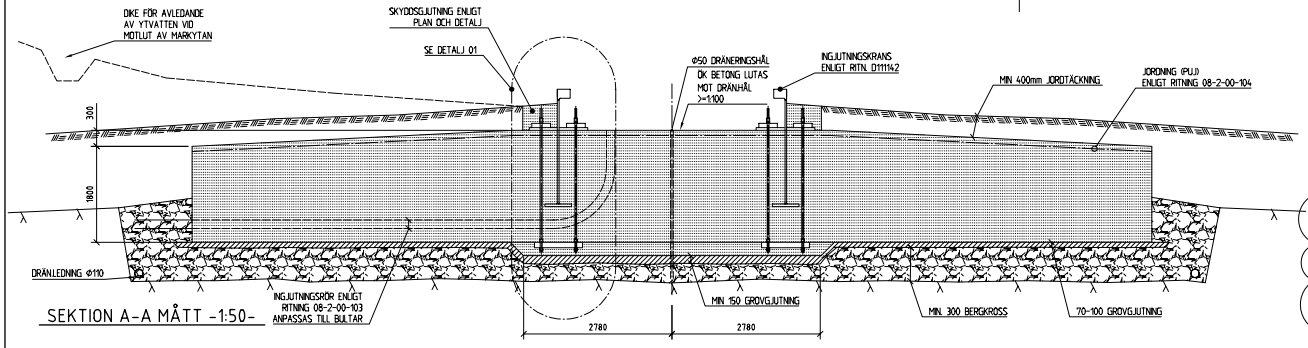
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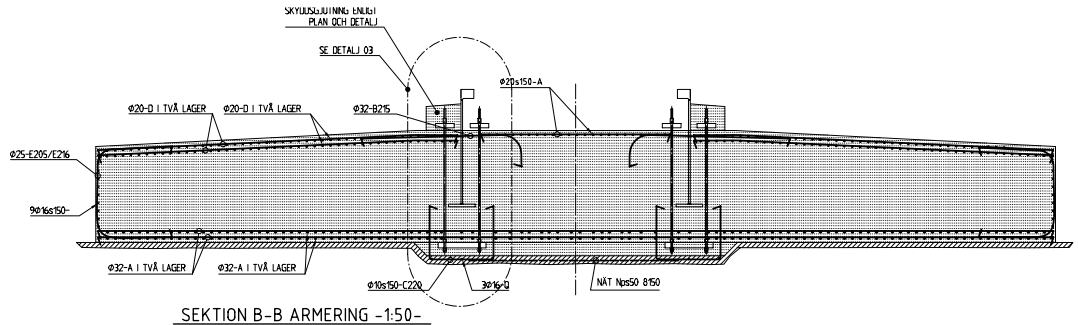


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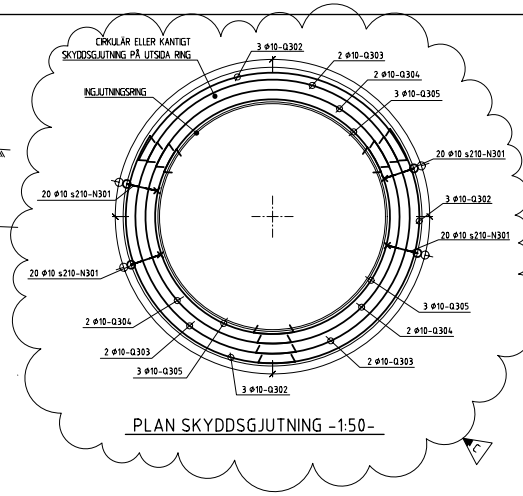
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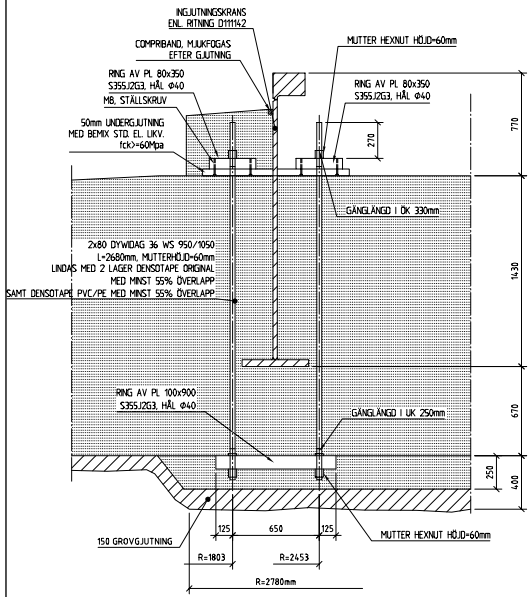
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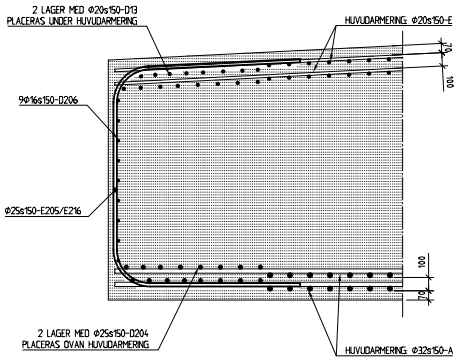
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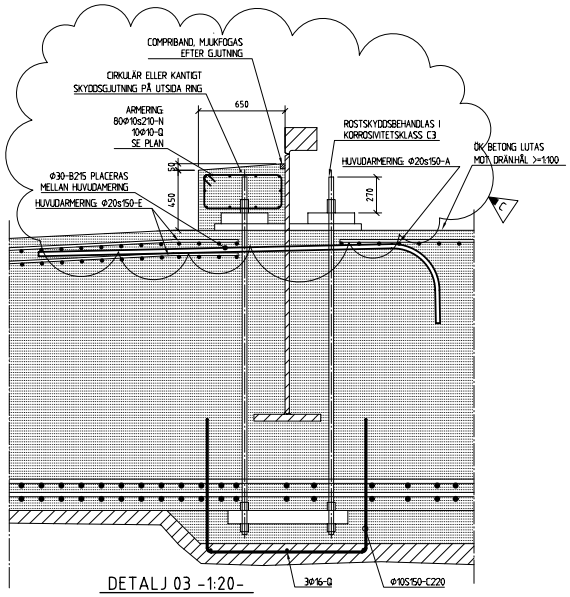
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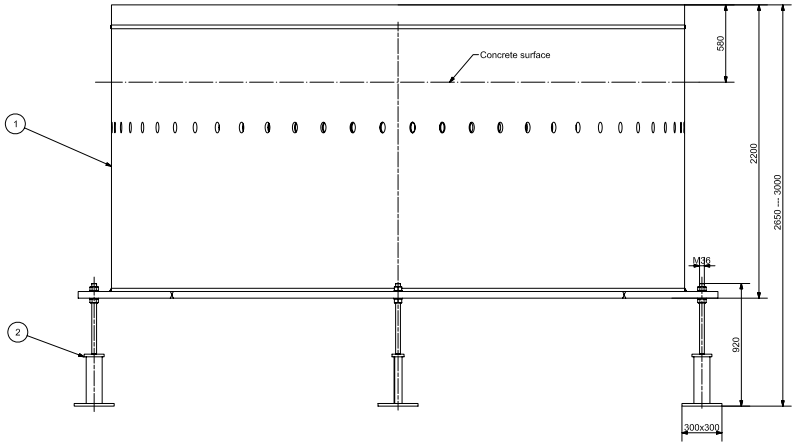
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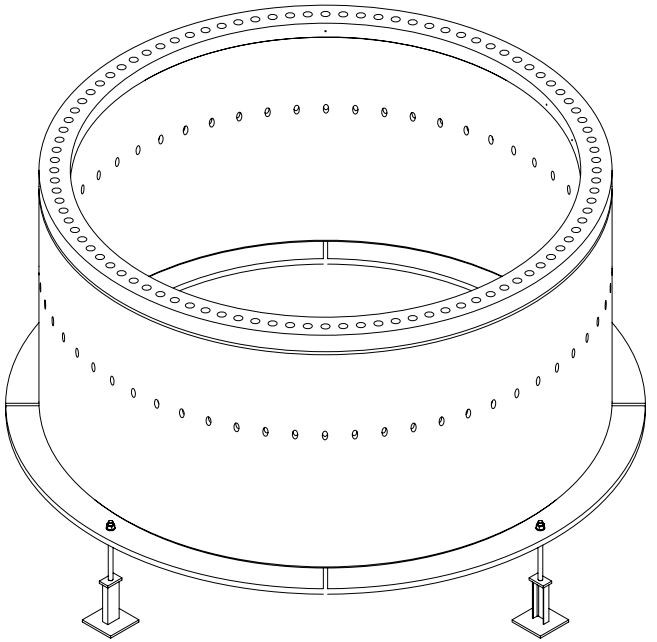
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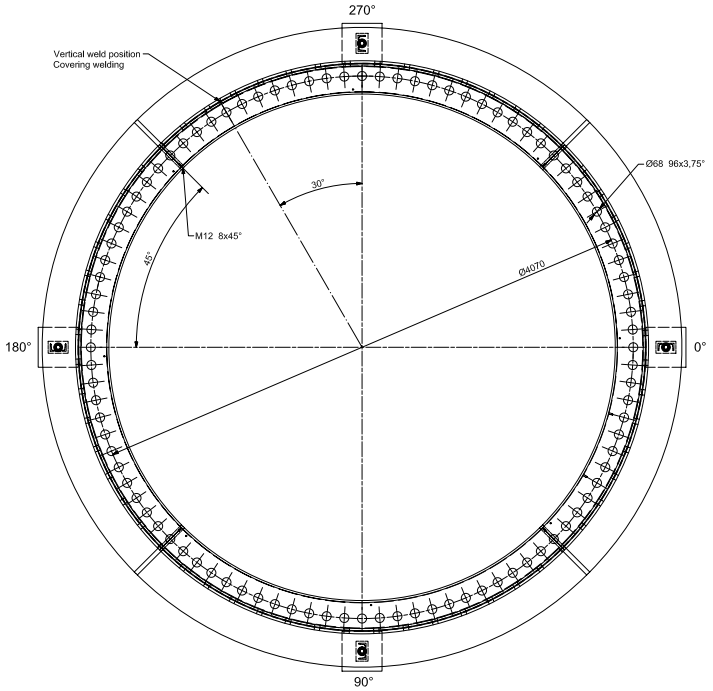
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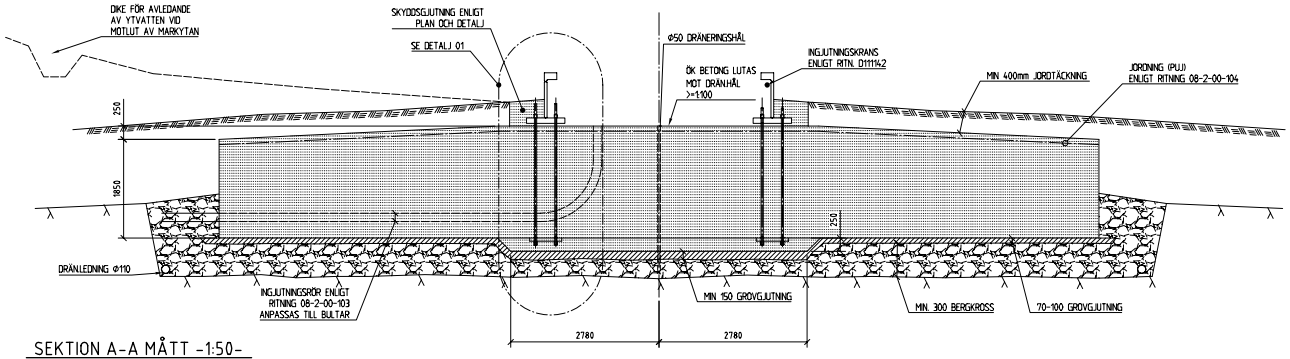
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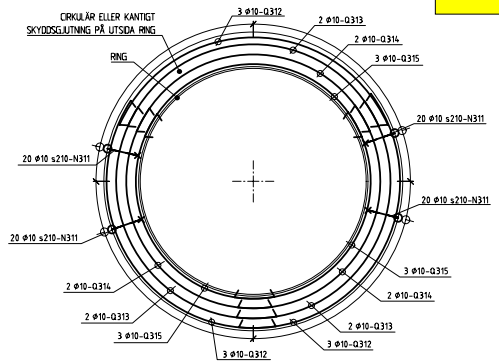
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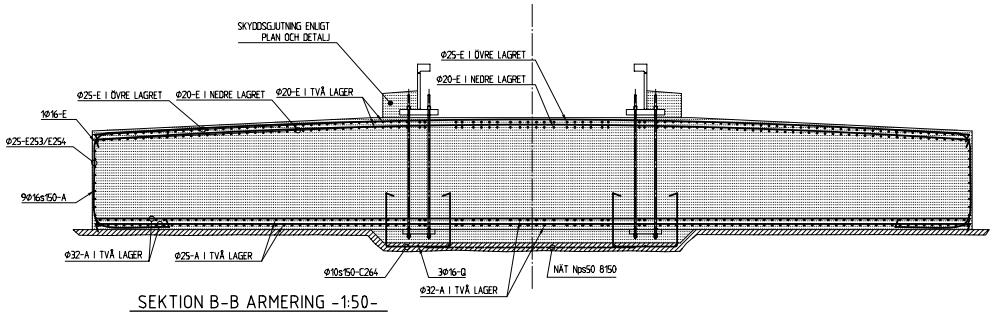
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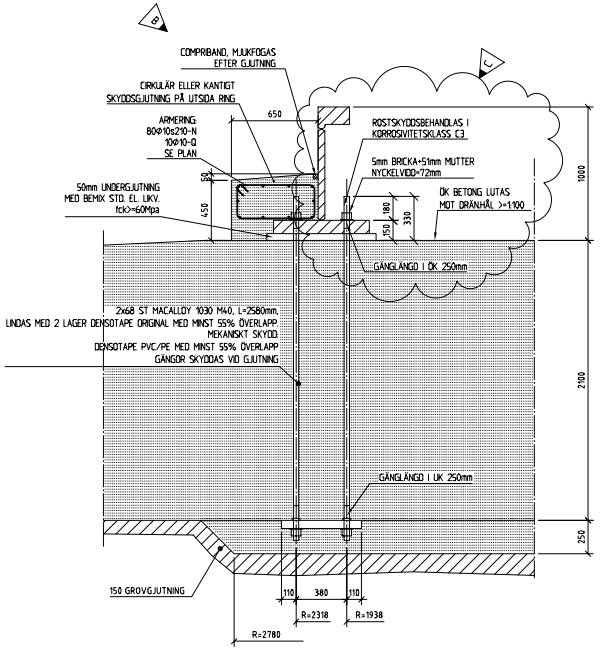
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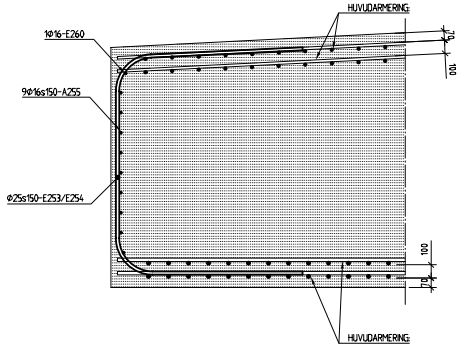
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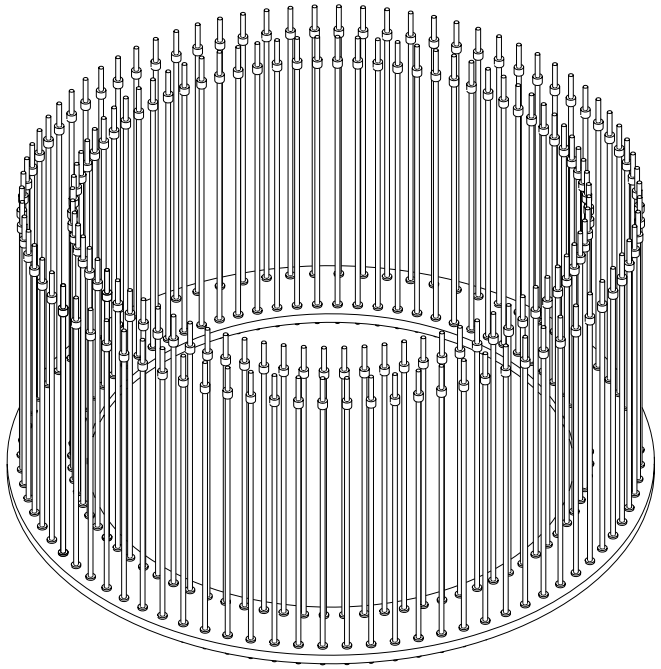
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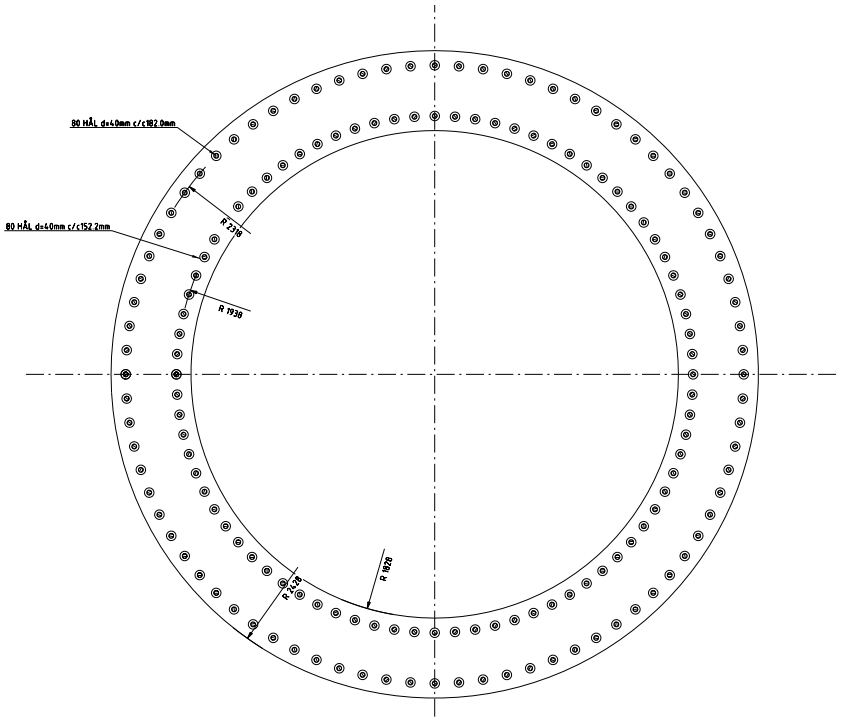
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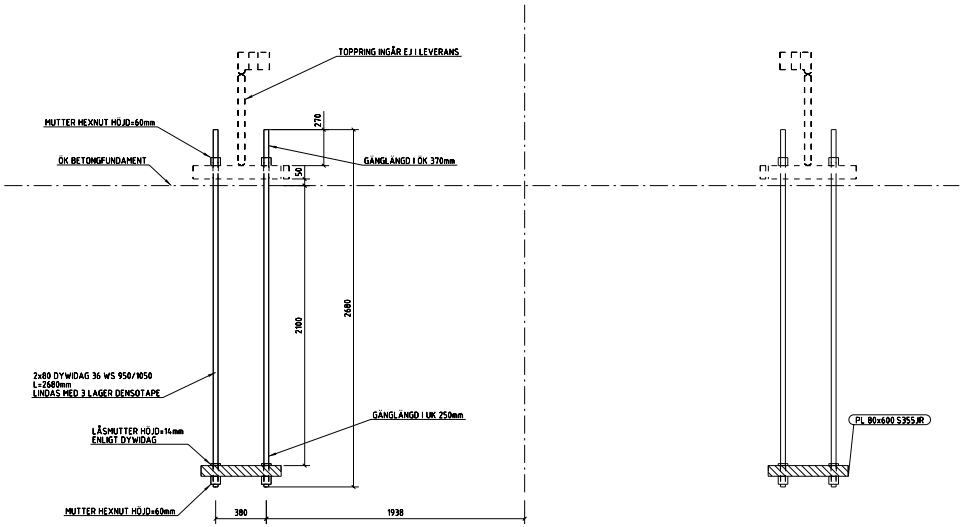
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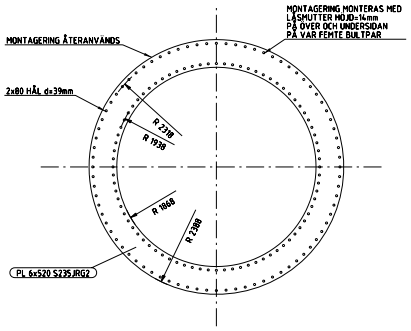
ISOMETRI



Plan
1:20



SEKTION



MONTAGERING
1:50

BYGGHANDLING

SKELLEFTEÅ KRAFT AB

ULJABUOUDA VINDKRAFTSPARK

WSP Byggprojektering
A Järnvägsgatan v.1
931 32 SKELLEFTEÅ
Tel: +46 910 58 64 00
Fax: +46 910 58 64 20

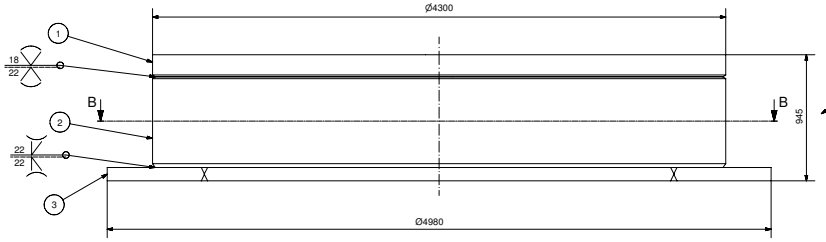
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DATUM 2009-06-24	GRANSKAD	

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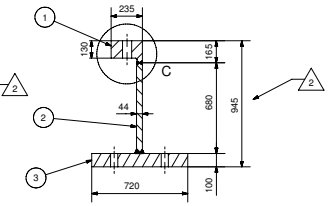
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PLAN, SEKTIONER

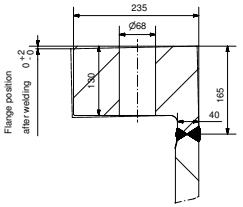
SKALA 1:20 1:50	RITNING NR K32-31-13	REV



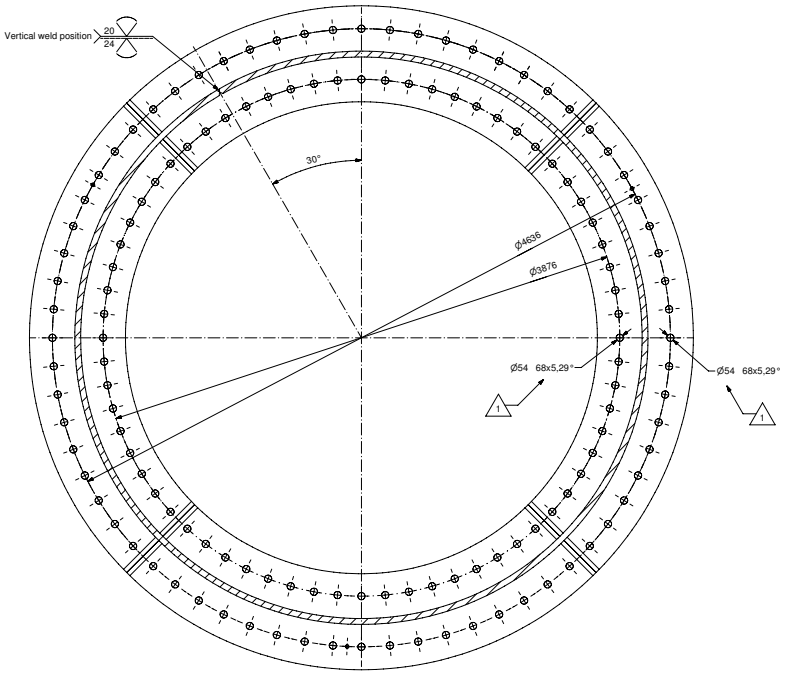
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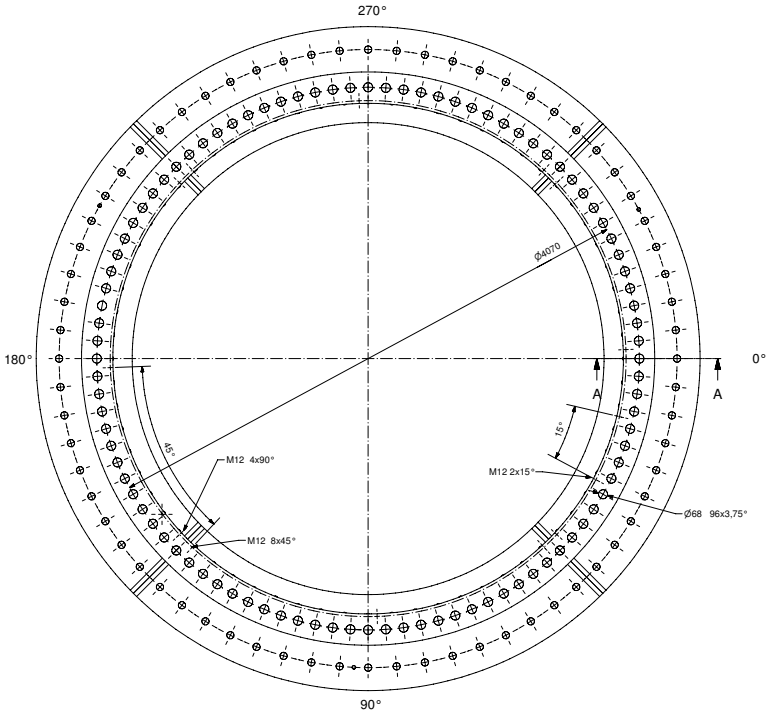


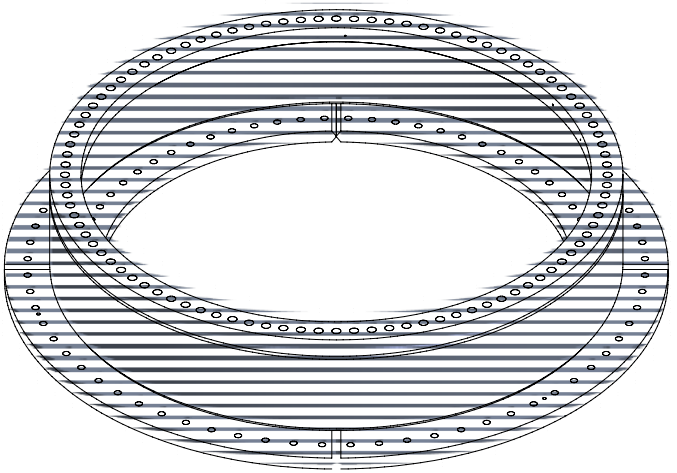
C (1 : 5)



B-B (1 : 20)







NOTES!

1. ALL WELDS FULL PENETRATION BUTT WELDS.

2. WELDS ACCORDING TO DOCUMENT S-TOW.01-A

3. FLANGES WELDING SEAM MUST BE LOCATED ON OPPOSITE SIDE FROM THE VERTICAL SEAM OF PLATES IF WELDING HAS BEEN USED IN FLANGE MANUFACTURING.

SURFACE TREATMENT ACCORDING TO DOCUMENT WWD-G-ENG-0-0346EN

Item	Qty	Stock	Title	Model code | Std, Size, Mat.	Mass
3	1	D111808	Flange		7245
2	1	D111807	Plate		3045
1	1	10023151	Flange 1		2833

Parts List

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Following general tolerances shall apply if not otherwise stated:
Machining: ISO 2768-mK
Weldings: ISO 13920-BF
Castings: ISO 8062 CT-12
Flame cutting: ISO 9013 Class II B, Field 2

Project/Product: WWD-3 | Paper size: A1 | Overall scale: 1:20
Calculated mass: 13124 kg
Title: Stud bolt foundation steel adapter

Designed by: ANy | Design date: 18.06.2009
Drawing made by: ANy | Dnw make date: 18.06.2009
Checked by: MAu | Check date: 25.06.2009
Approved by: MIK | Approval date: 25.06.2009

Winwind Oy
Finland
www.winwind.fi

Tower S80

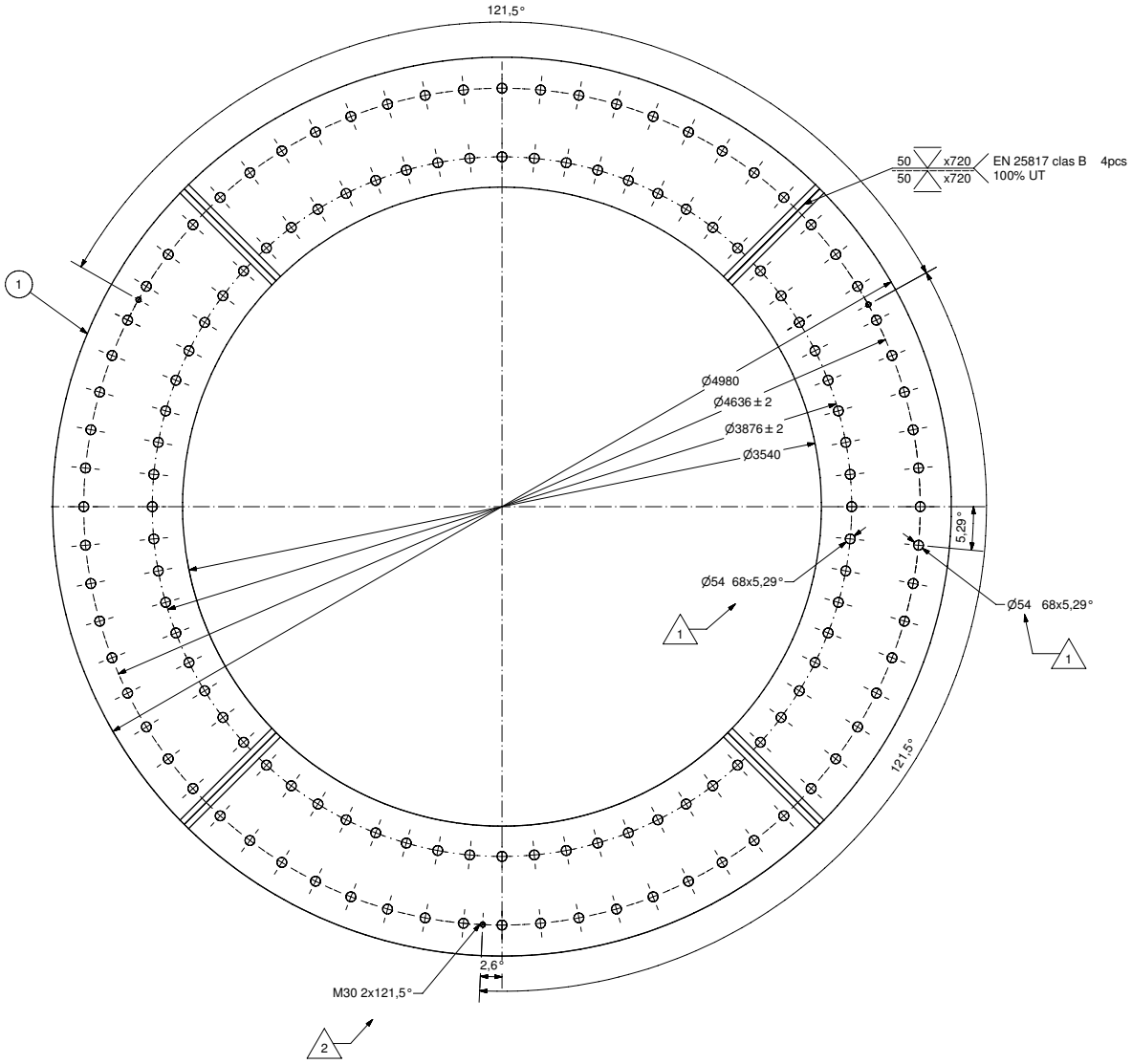
Model code: ~~20039045.1~~ | Drawing code: 20039047.3 | Sheet nr.: 1 / 1

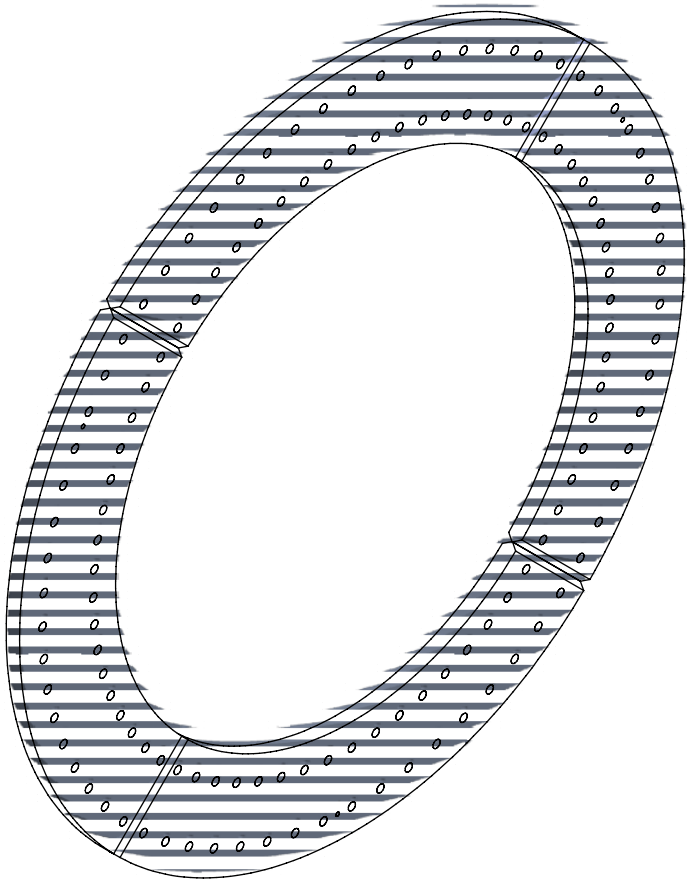
Confidential

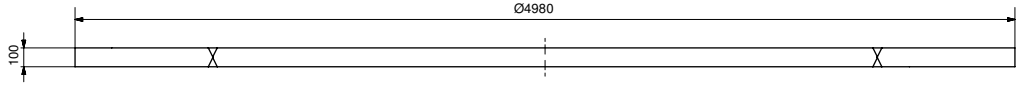
Stock code: D111806 | Revision: 3

Rev	Zone	Dsgn	date	Chkd	date	Appd	date	Revision Note
3		ANy	09.02.2010	MAu	09.02.2010	MIK	09.02.2010	Parts 2 modified
2		ANy	9.10.2009	MAu	9.10.2009	MIK	9.10.2009	Parts 2 modified
1		ANy	16.09.2009	MAu	16.09.2009	MIK	16.09.2009	Dimension modified

Revision history







Rev	Zone	Dsgn	date	Chkd	date	Appd	date	Revision Note
2		ANy	09.02.2010	MAu	09.02.2010	MiK	09.02.2010	Added M30 thread hole
1		ANy	16.09.2009	MAu	16.09.2009	MiK	16.09.2009	Dimension modified

Revision history

Item	Qty	Stock	Title	Model code | Std, Size, Mat.	Mass
1	4	D111809	Plate		1873

Parts List

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Following general tolerances shall apply if not otherwise stated:
Machining: ISO 2768-mK
Weldings: ISO 13920-BF
Castings: ISO 8062 CT-12
Flame cutting: ISO 9013 Class II B, Field 2

Project/Product: WWD-3	Paper size: A2	Overall scale: 1:20	
Calculated mass: 7245 kg	Title: Flange		
Designed by: ANy	Design date: 18.06.2009		
Drawing made by: ANy	Drw make date: 18.06.2009		
Checked by: MAu	Check date: 25.06.2009	Model code: 20038902.1	Drawing code: 20038944.2
Approved by: MiK	Approval date: 25.06.2009	Stock code: D111808	Revision: 2

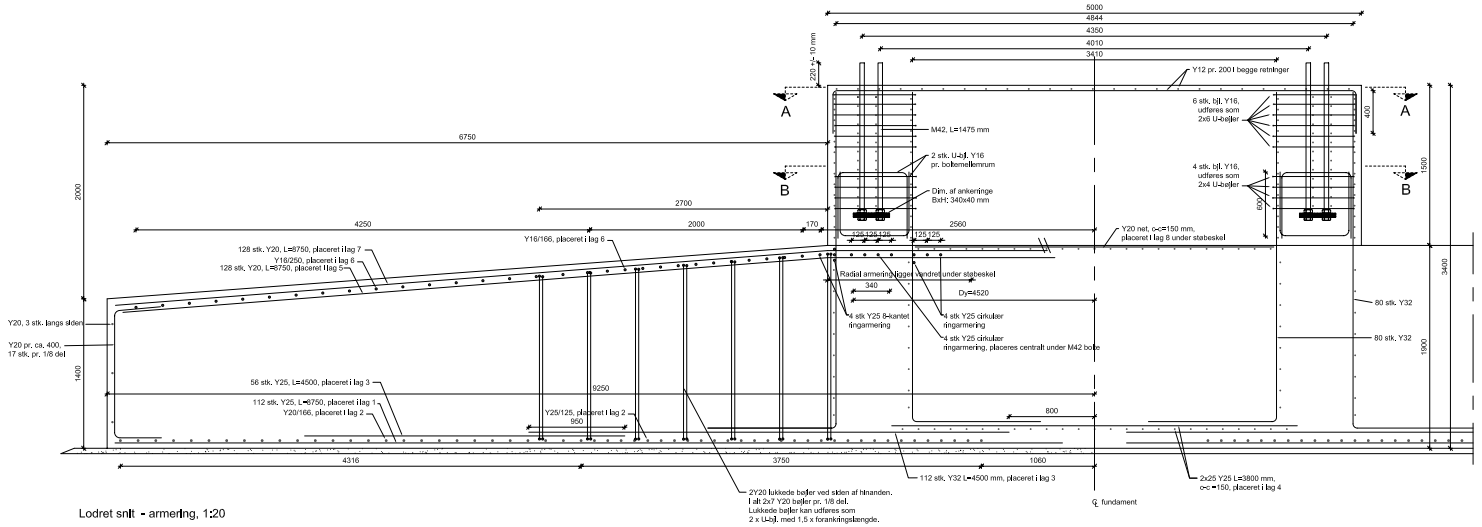
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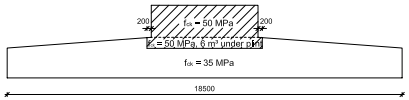
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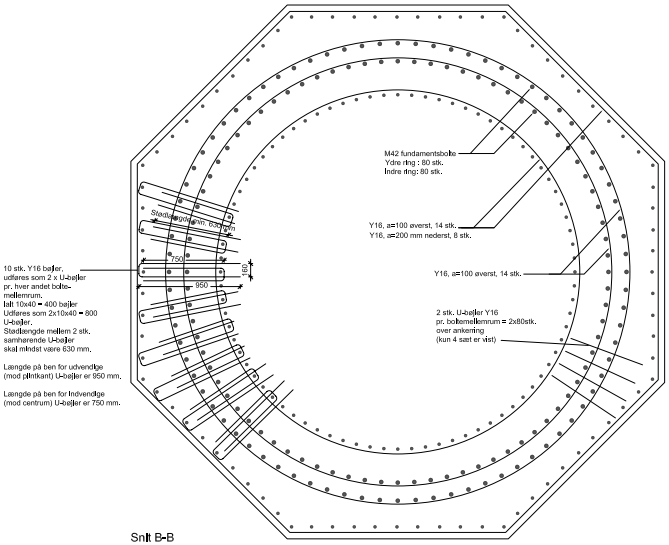
Appendix 4 – 1/1



Lodret snit - armering, 1:20

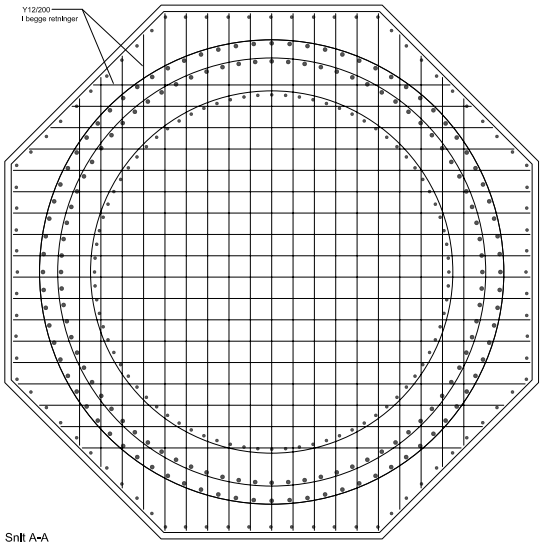


Anglvelse af betonstyrke



Snit B-B

Armering i bund af plint, 1:20



Snit A-A

Armering I top af plint, 1:20

NOTE:

Ubenævnte mål er i mm.
Koter er i m, DVR 90.

Montagearmering er ikke vist.
Armering må ikke svejses.

HENVISNING:

Vedr. jording og placering af føringsrør henvises til tegn. nr. BN121 og BN122.

Vedr. materialer og udførelse henvises til tegn. nr. BN100 samt SB.

Vedr. radialarmering i bundplade, se tegn. nr. BN112 og BN113.

Index	Dato	Tegn.	Kontr.	Godk.	Beskrivelse

Filnavn:	Målestok:	Format:			
UMBN111	1:20	60x84	Tegnet	25.02.2010	BHK
			Kontrolleret	25.02.2010	DVG
			Godkendt	25.02.2010	CAN

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Grøntmij | Carl Bro VATTENFALL

2331.06

Vattenfall Vindkraft A/S
Hagesholm
Fundament - Armering
Lodret snit

UM/

BN111 a

Vattenfall Vindkraft A/S, c/o Oldenborggade 25 - 31, 7000 Fredericia, Danmark - Tlf. 88 27 50 00

003791





Figure 1 – Footing founded on the bedrock. The footing is anchored to the bedrock. Please notice the load spreading plate which is anchored by the stud bolts. The tower flange will be mounted on the plate. Please also notice that the photos do not refer to the same object. However, the objects are in the same site and principally identical.







Figure 2 – Insert rings are also used for foundations on the bedrock.

ELFORSK

SVENSKA ELFÖRETAGENS FORSKNINGS- OCH UTVECKLINGS - ELFORSK - AB

Elforsk AB, 101 53 Stockholm. Besöksadress: Olof Palmes Gata 31
Telefon: 08-677 25 30, Telefax: 08-677 25 35
www.elforsk.se

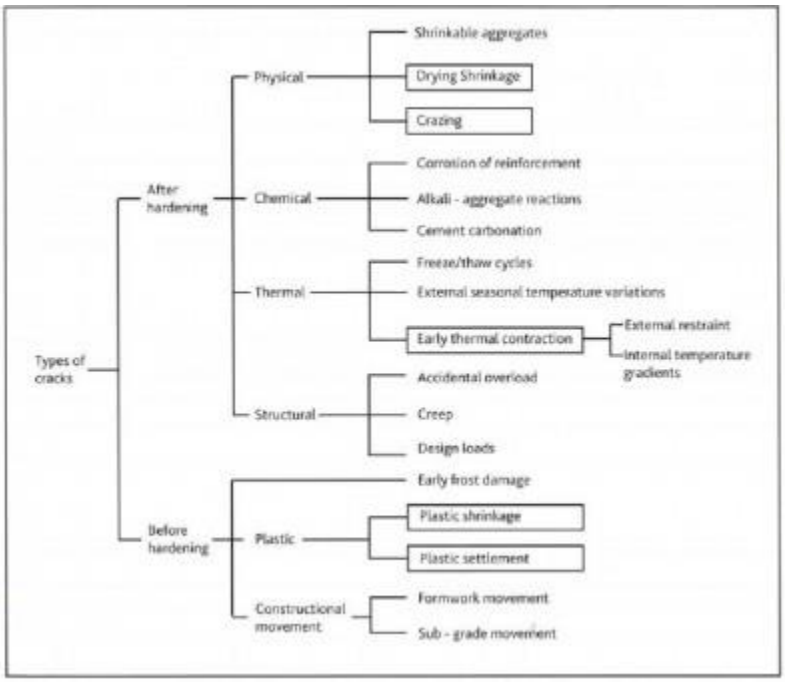
May 24, 2014 • Technology

Cracks in onshore wind turbine foundations

Author: Miceli, Francesco

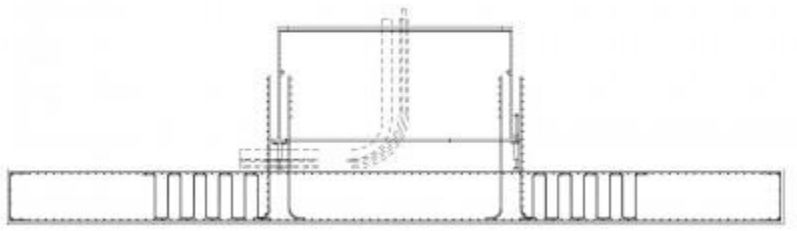
The appearance of fissures in wind turbine foundations is a rather common event.

There is no consensus in the sector about the root cause of the cracks. You can find a comprehensive family tree of fracture types below:



From my experience it seems that old foundations with embedded ring are more prone to fissures compared to the new foundations with anchor cage.

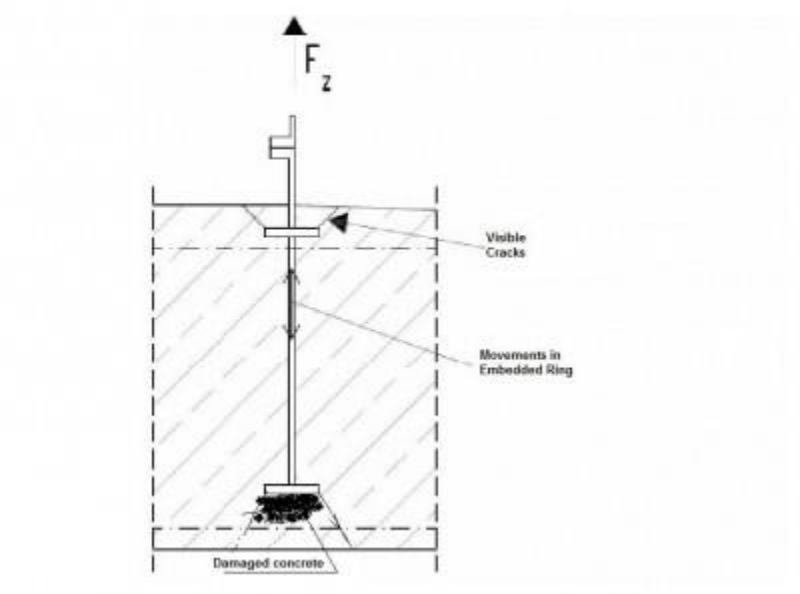
Among the foundations with embedded ring, high pedestal foundations like the one in the following picture are the most problematic:



Visiting old wind farms I've observed both radial cracks and concentric superficial cracks in the visible superficial concrete around the tower.

However it seems that the more dangerous fissures are the ones appearing below the lower flange. Apparently the load concentration below the steel plate, in combination with cyclic loads, can damage the concrete inducing small movements. This is an area where [it] is very complicated to pour correctly the concrete: the air can remain trapped, lowering the resistance of concrete.

After several cycles, these movements can pulverize the concrete below the flange and increase from few millimeters to a centimeter or even more.



At this point, the superficial sealing between the embedded ring and the concrete won't be able to withstand the displacement and will break. Subsequently, water will be able to enter the foundation: this will lead to a pumping effect, possibly even freezing and expanding in low temperature areas.

Several side effects will start, such as carbonation and possibly to reinforcement bars corrosion. Subsequently, it will be necessary to stop the wind turbine and undertake remedial works.

Regarding the root cause, the explications frequently quoted can be categorized in 2 groups:

- Design error: fatigue loads and stress concentration below the lower flange were underestimated, wrong steel design.
- Construction error: the concrete below the lower flange was not of the proper quality, or it wasn't correctly vibrated or cured. Sometimes even concrete pouring at very low or high temperature or improper installed reinforcement is quoted as a possible cause, together with pouring sequence problems (joint between concrete layers which are already hardened due to delays in concrete supply).

It is more unusual to have environmental problems, such as water aggressiveness or other chemical problems.

As solution, sufficient vertical reinforcement and anchorage length should be provided. Some designers also like to position the bottom flange as high as possible to increase the thickness of the concrete below.

—*September 20, 2012, windfarmbop.com*

You can read more here: "Cracks in onshore wind turbine foundations", Manouchehr Hassanzadeh, January 2012

March 20, 2018

The Grant County Commission met at 8AM with Commissioners Buttke, Dummann, Mach and Stengel. Commissioner Street absent. Chairman Buttke called the meeting to order. Motion by Mach and seconded by Stengel to approve the minutes of the March 6, 2018 meeting. Motion carried 4-0. Minutes filed. Motion by Mach and seconded by Stengel to approve the agenda with the deletion of item 8 - cash transfers. Motion carried 4-0.

Members from the public were Kelly Owen, Kristie Mogen, Teresa Kaaz, Derek Nelson, Paul Nelson, Marlyn Johnson, William Tostenson, Mark Erickson, Vince Meyer, Randy Schmeig, Bob Hicks, Jim DeVaal, Jake Peterson, Christian Reimche, Dan Scoblic, Denise Scoblic, Greg Wall, Kathy Tyler, Tim Tyler, Bobbi Bohlen, George Holborn, Ruby Holborn, Patricia Meyer, Kevin Krakow and Dan Seurer.

The Auditor's account with the Treasurer for February was noted.

AUDITOR'S ACCOUNT WITH THE COUNTY TREASURER

To the Honorable Board of County Commissioners,
Grant County:

I hereby submit the following report of my examination of the cash and cash items in the hands of the County Treasurer of the County of Grant as of the last day of February, 2018

Cash on Hand	$2,141.33
Checks in Treasurer's possession	
less than 3 days	$23,584.50
Cash Items	$0.00
TOTAL CASH ASSETS ON HAND	**$25,725.83**
RECONCILED CHECKING	
First Bank & Trust	$23,065.68
Interest	$0.00
Credit Card Transactions	$2,615.47
First Bank &Trust (Svgs)	$4,087,061.00
CERTIFICATES OF DEPOSIT	
First Bank & Trust	$0.00
First Bank & Trust (TIF)	$340,125.91
TOTAL CASH ASSETS	**$4,478,593.89**

GENERAL LEDGER CASH BALANCES:	
General	$1,694,236.35
General restricted cash	$1,500,000.00
Cash Accounts for Offices General Fund	$605.00
Sp. Revenue	$219,921.94
Sp. Revenue restricted cash	$0.00
Henze Road District	$287.15
TIF Apportioning Northern Lights	$0.00
TIF Milbank	$0.00
TIF Northern Lights	$340,125.91
Trust & Agency (schools 270,619.56, twps 19,218.83, city/town 40,425.50)	$723,417.54
TOTAL GENERAL LEDGER CASH	**$4,478,593.89**

Dated this 12th day of March, 2018
Karen M. Layher
County Auditor

Sheriff's fees for the month of February were $8,405.68 with $4,021.09 receipted into the County's General Fund. The Register of Deeds fees for the month of February were $6,207.50. The Clerk of Courts fees for the month of February were $13,772.58.

Drainage: Chairman Buttke adjourned the Board of Commissioners and convened the commission acting as the Drainage Board. The Drainage Administrator presented the following permit.
Permit DR2018-02 by Marlyn Johnson in 02-118-49 (Georgia Twp). The request, if granted, would allow the landowner to install sediment dams and control erosion to improve productivity. The wetland determination is completed, letters have been returned with signature for three riparian landowners and the tile map drawing has been received. Motion by Dummann and seconded by Stengel to approve DR2018-02 as presented. Motion carried 4-0.

Permit DR2018-03 by Marlyn Johnson and Ben Johnson in 29-119-49 (Madison Twp). Krista reported the request, if granted, would allow the landowners to improve areas for crop production. Three letters from riparian landowners were signed for and the wetland determination has been received in addition to the tile drawing maps. Motion by Dummann and seconded by Stengel to approve DR2018-03 as presented. Motion carried 4-0.

Permit DR2018-04 by Jim DeVaal in 04-120-48 (Georgia Twp). The request, if granted, would allow the landowner to improve farming practices. This permit is a previously

completed project that contained vested drainage that was converted to modern tile. The landowner did not know this type of conversion requires a new permit. Four letters were sent out to the required two mile downstream riparian landowners. The project did not involve wetland areas and flows from 50' on the applicant's own property through an existing culvert. Motion by Dummann and seconded by Stengel to approve DR2018-04 as presented. Motion carried 4-0.

Commissioner Street arrived at 8:13 AM after discussion had occurred on the drainage permits.

Big Stone City resident Randy Schmeig addressed the Commission on his concern of tiling permits adding additional water into the natural runs. He questioned how much additional water can be dumped into the run as it affects his property with the erosion of the river bank. Commissioner Stengel explained tiling releases water at a steady rate through the tile as a controlled flow. The over land flooding caused by a large amount of rain at one time contributes to soil erosion. Randy stated he was told this is a county issue and needs helps stabilizing the river bank. Commissioner Stengel will talk to other levels of government for advice.

This concluded the business for the drainage board. Chairman Buttke adjourned the Drainage Board and reconvened the Board of Commissioners.

4-H: Advisor Sara Koepke presented a proposal for the building of an 80' X 180' multi-purpose building at the 4-H grounds. Estimated cost of construction is $544,000. This structure would replace the existing static exhibit building which is in need of repair and does not provide adequate storage, bathrooms and space for both the archery and shooting sports programs. Her goal is to bring the 4-H programs under one location. Currently, the 4-H archery program is held in conjunction with the Valley Archers' in the Valley Queen building on Main Street. Two members of the Valley Archers, Scott Dahl and Steve Cramer, spoke of working with the county on an agreement to use the new facility and the possibility of donating to the project in addition to paying rent. The general consensus of the Commission was positive to research funding options for the proposed project and agreed a committee should be formed to research this proposal. Motion by Dummann and seconded by Street to appoint Commissioner Buttke, who is the building and grounds commissioner to serve on the 4-H Static Exhibit Building Committee. Motion carried 5-0.

Highway: Motion by Dummann and seconded by Street to set April 3 for the annual bid letting of highway supplies with the bid opening to be March 30 at 1PM and the acceptance of the bids to be at the April 3 meeting at 8:15 AM. Motion carried 5-0.

Wind Energy: The Commission opened a discussion on setbacks for non-participants of wind towers. Kelly Owen had asked to address the agenda item. He stated he is farmer / rancher in the Stockholm area and would like to pass the land and way of life onto his children. His concerns with wind energy are being surrounded by the wind towers, the massive size of the towers, the change to the landscape and the effect on individual's lives and the livestock. He addressed the Commission as an individual and representing others. He requested to have entered into the record a resolution he read entitled: Resolution Creating Safe Setbacks from Industrial Wind Turbines (IWT). The final paragraph of the resolution reads, Be it therefore Resolved: To uphold Grant County Compiled Zoning Ordinance dated 1-25-2018 Grant County establishes a requirement for best practice aircraft lighting detection system and an Industrial Wind Turbine 2-mile setback from a nonparticipating owner property line, allowing for a waiver. The entire resolution is on file in the Auditor's Office.

Commissioner Dummann and Street expressed that good points had been made by Kelly Owen as there are long term effects of the towers for the landowners and having the P & Z Board review the regulations would be good. Kelly Owen also expressed concerns of the blinking red lights at night and the flicker effect from the blades. He asked the Commissioners to place a moratorium on wind energy to allow the Commission time to review and update the regulations on wind energy and make it work for everyone.

Discussion was held on opening the section of the ordinance on wind energy and placing a moratorium. Currently two wind farms have received a conditional use permits and another wind farm is going through the State permit process first before applying at the local level. Auditor Layher suggested a special meeting be called because the States Attorney was not available to answer questions on the moratorium or the Commission could motion for the section of regulations on wind energy be opened for review by the P & Z Board.

Auditor Layher suggested trying to contact the States Attorney or First District of Local Government for advice. The Commissioner asked Auditor Layher to make the phone calls and to report back to the meeting on the information obtained. Auditor left the meeting after the appointment for the Historical Society to make the phone calls.

Sheriff: Kevin Owen presented the following statistics for the month of February for the Detention Center were: Average Daily inmate population 6.67; Number of bookings 24; Work release money collected $1,150.00; 24/7 Preliminary Breath Test (PBT) fees collected $1,551.00; SCRAM (alcohol detecting bracelet) fees collected $136.00; 24/7 PBT participants 7; SCRAM (Sobriety Program) participants 3; Calls for Service (does not include walk-in traffic) 317; Accidents investigated 5; Civil papers served 63; Cumulative miles traveled 5,094; 911 calls responded to (including Milbank) 56. 911 Annual Report: The 2017 911 Annual report was reviewed. The fund balance at year end is $32,525.62. The 911 Fund revenues were $92,549.27 with $100,280.04 of expenses.

Historical Society: President for the Society Arlo Levisen, brought forth a request for additional financial assistance to assist with the re-shingling project of the house and the school located across the street from the Justice Museum. He explained to keep in the building period of the structures, wood shingles would be correct. The quote he has received from Lapp Builders is $19,250 for the house and $7452 for the school. The cost of asphalt shingles would be approximately half. Arlo suggested completing one building per year. The yearly allocation received from the county goes for the insurance, utilities and curator. A discussion was held on wood versus asphalt. Motion by Street and seconded by Dummann to allocate funding of $3000 for the asphalt project of the school. Motion failed 0-5. Motion by Street and seconded by Dummann to allocate $6000 for the wood shingle project of the school building. Motion carried 5-0.

Auditor Layher left the meeting to make phone the phone calls and Deputy Auditor Joan Czmowski took over minutes for the meeting.

Economic Development: Executive Director Bobbi Bohlen reported from the survey they are looking into the areas of education, economy and school life. Milbank graduates who had left and came back to Grant County attended Career Day and gave the students an insight on what opportunities are available in Grant County. She is also working on grant requests for infrastructure and school. Economic development is helping Milbank School to partner up with Lake Area Technical School on credited classes for Juniors and Seniors.

Land Lease: The land lease sale was held at 9:15 AM and the following bids were received:

1. S ½ NE ¼ of 8-120-51 (40 Acres) Mazeppa Twp. The lease will be offered to John Moes who has leased the land in prior years for $40 per acre.

2. Part of the NW ¼ NW ¼ 33-120-47 (About 15 Acres) Alban Twp. leased to Mielitz Brothers for $600.00.

Wind Energy: Auditor Layher reported she was unable to contact the States Attorney but had spoken with Todd Kays at First District. As indicated before the Commission may motion for the P & Z to review the wind energy regulations and make recommendations back to the Commission. A special meeting may be called. The issue of a moratorium needs to be placed on the agenda before any action may be taken. Motion by Dummann and seconded by Street to set a special meeting for March 27 at 10 AM for item one: a discussion on the county zoning regulations regarding Wind Energy Systems (WES) and possible action to request the P & Z Board to review existing regulations and make a recommendation(s) to the Commission regarding the zoning regulations on Wind Energy Systems and item two: being a discussion and possible action on a moratorium of Wind Energy Systems during the review process of the WES regulations. Motion carried 5-0.

Dakota Range Wind: A request from the wind project to submit the project letter of support approved by the Commission in October of 2017 to the PUC for the public hearing. No action was taken, letter will not be sent.

Travel: Motion Dummann and seconded by Stengel to approve travel expenses for Hwy Supt Schultz to attend an asphalt Conference in Pierre. Motion carried 5-0.

General Fund Report: Auditor Layher reviewed the general fund cash analysis report. Under SDCL 7-21-18.1 the law states the general fund unassigned cash balance of the general fund may not exceed 40% of all general fund appropriations contained in the budget for the next fiscal year. The unassigned cash for December 31, 2017 is $1,067,379.37 and the percentage is 20.49% of the 40% general fund cash test. This report is done by the modified accrual basis and includes accounts payable of $36,084.80. Motion by Stengel and seconded by Mach to approve filing the report with SD Dept of Legislative Audit. Motion carried 5-0.

Courthouse: Motion by Street and seconded by Stengel to approve the quote of $8,872.03 from Larry's Refrigeration and Heating for the replacement of the thirteen cooling valves on first floor and the basement for the completion of the HVAC project in the Courthouse. Motion carried 5-0.

Election Precincts: Auditor Layher requested approval to establish the use of all 18 precincts for the Primary and General Elections in 2018 as under SD Election

Rules, the precinct ID must be printed on the ballot. Motion by Stengel and seconded by Street to approve assigning all eighteen election precincts for 2018. Motion carried 5-0.

Unfinished Business: None

New Business: Auditor Layher reported Librarian Jody Carlson will be advertising for staff due to a resignation and scheduling issues with part-time staffing, but there will not be any additional impact to the 2018 budget.

Correspondence: A copy of the 2017 Sales Ratio and Compliance Audit Report from SD Dept of Revenue was given to the Commission for their review. The Commission is invited to attend the First District Governing Body meeting in Watertown on March 29 at 4 PM.

Holiday Closing: Auditor Layher reported Governor Daugaard has designated Monday April 2 for offices to be closed to allow employees time with family for Easter. As per the county policy to follow the state declared closings, the county offices will be closed on Monday, April 2.

Consent Agenda: Motion by Mach and seconded by Street to approve the consent agenda. Motion carried 5-0.

1. Approve Plats:

2018-04

COUNTY COMMISSION RESOLUTION

Lots 1 of Cory and Haley Harms Addition, located in W1/2SW1/4 of Section 20, Township 121 North, Range 47 West of the 5th P.M., Grant County, South Dakota, as described above and hereon be approved and accepted and the Chairman is hereby instructed to endorse on such plat this resolution and to certify the same.

Marty Buttke, Chairman
Board of Commissioners
Grant County, South Dakota

2018-05

RESOLUTION BY THE BOARD OF COUNTY COMMISSION GRANT COUNTY SOUTH DAKOTA

"Be it resolved by the Board of County Commissioners of Grant County, South Dakota in regular meeting assembled that the plat of Lot A and Lot B in Lot 1 of the Jeremiah McFarland Subdivision, located in the south half of the north half of the southeast quarter (S1/2 N1/2SE1/4) and the south half of the north half of the southwest quarter (S1/2N1/2SW1/4) of Section thirty-one (31), Township one hundred twenty (120) North, Range fourty-seven (47) West of the 5th P.M., Grant County, South Dakota be approved this 20th day of March, 2018 in accordance with the provisions of SDCL 11-3 and all acts amendatory thereto." I, Karen M.

Layher, County Auditor of Grant County, South Dakota, certify that this is a true copy of the resolution adopted by the Board of Commissioners of Grant County, South Dakota.
Dated this 20th day of March, 2018.

Karen M. Layher, County Auditor,
Grant County, South Dakota

2018-06
Resolution

BE IT RESOLVED by the Board of County Commissioners of Grant County, South Dakota the plat entitled: "Lot 1 of 1892 Olson Homestead Addition in the County of Grant, South Dakota, located in the Southwest Quarter (SW1/4) of Section 8, T 121 N, R 52 W of the 5th P.M., in the former Sisseton Wahpeton Indian Reservation in Grant County, South Dakota", which has been submitted for examination pursuant to law, and it appearing that all taxes and special assessments have been paid and that such plat and the survey thereof have been made and executed according to law, the plat is hereby approved, and the County Auditor is hereby authorized and directed to endorse on such plat a copy of this Resolution and certify the same.

Dated this 20th day of March, 2018.

Karen M. Layher, County Auditor,
Grant County, South Dakota

1. Set April 3 at 8:45 AM for hearing on application for a one day Special Event Malt Beverage License by David Rufer for an event at the Pride of the Cats Building , formerly the Grant Deuel School on April 7th
2. Approve Annette Redepenning as Deputy Treasurer effective April 9 at $15.40 per hour
3. Declare surplus a 1993 Chevy 350 Pickup (4 door), 1967 Ferguson Steel Face Roller, 2006 Monroe Sander, 1967 Case Tractor, a 1979 Wildcat Blower and (2) black cloth/silver frame chairs-asset number 1302 and 1818

Claims: Motion by Stengel and seconded by Street to approve the claims as presented. Motion carried 5-0. A-OX WELDING, supplies 18.04; BERENS, supplies 24.68; BIERSCHBACH EQUIP, parts 252.00; BORNS GROUP, mailing expense 2,829.30; BUREAU OF INFO & TELE, internet & email 505.75; BUTLER, shipping expense 13.51; CENTER POINT, books 551.67; CENTURYLINK, phone 588.67; CERTIFIED LANGUAGES INTERN, prof service 31.35; CITY OF WATERTOWN, 911 surcharge 6,464.82; MILBANK GLASS & MORE, mirror 102.86; CRAIG DEBOER, car wash 100.00; DELORIS J RUFER, rent 100.00; DEMCO, supplies 149.34; DEUTSCH PRINTING, subscription 90.00; LONGRIDER BOOKS, books 726.58; EMERY PRATT, books 96.82; EQUIPMENT BLADES, parts 134.00; FLOWER SHOPPE, supplies 45.00; GALE GROUP, book 12.00; FOOD-N-FUEL, prisoner meals 1,218.00; GRANT CO SHERIFF, postage 9.95; GRANT CO REVIEW, publishing 987.19; HARTMAN'S, 4-H supplies & prisoner meals 983.68; HASSLEN, contract project 725.00; INGRAM, books 576.30; INTER-LAKES COMM ACT, worker 2,192.00;

ITC, 911 transport 1,253.99; KIBBLE EQUIP, parts 13.25; LABOLT DEVELOPMENT, internet & rent 90.00; LARRY J TRAPP, repair 190.33; LEARNING OPPORTUNITIES, books 496.39; LEWIS FAMILY DRUG, prisoner RX & supplies 87.67; LIBRARIANS' BOOK EXPRESS, books 342.41; LIBRARY SALES, books 314.97; MICROFILM IMAGING SYSTEMS, scanner rent 417.00; MICROMARKETING, supplies 100.94; MIDAMERICA BOOKS, books 323.10; MIDCONTINENT, internet 90.53; MIDWEST POWERSPORTS, key 11.79; MILBANK AREA HOSPITAL, BLAB 404.00; MILBANK COMMUNICATIONS, radio 643.93; MILBANK WINWATER WORKS, parts 18.72; MOMAR, supplies 157.10; NELSON LAW OFFICE, allocation 3,969.88; NORTHERN TRUCK EQUIP, parts 174.54; NORTHWESTERN ENERGY, nat gas 438.49; NOVAK, shredding service 187.74; OFFICE PEEPS, supplies 32.40; OLDE MILL HOSPITALITY, room 87.20; OTTER TAIL POWER CO, electricity 4,706.55; PCMG, printer 315.00; QUICK PRO LUBE, tires 628.00; QUILL, supplies 83.15; RC TECHNOLOGIES, 911 transport & tower rent 95.96; RDO EQUIP, parts & repair 2,153.88; RELIANCE, phone cards 500.00; RELX, online chgs 705.00; ROGER A. BRIGGS, parts 58.30; RUNNINGS, supplies 786.04; RYAN MAGEDANZ, parts & repair 402.63; SCOTT R BRATLAND, ct appt atty 13,536.51; SD ASSN CO COMM, CLERP 3,311.00; SD DEPT OF REVENUE, BLAB 987.49; SD EM MGMT ASSN, dues & regis 95.00; SD POLICE CHIEF'S ASSOC, regis 85.00; SD STATE HISTORICAL SOC, dues 40.00; SDSU EXTENSION, regis 30.00; SEEHAFER, supplies 63.57; SHOPKO, supplies 119.98; ST WILLIAMS, inmate laundry 327.60; STAR LAUNDRY, prof service 41.32; TECH ONE, prof service 253.75; THE WINDOW PLACE, windows 1,387.76; TOWN OF STRANDBURG, internet 272.40; TWIN VALLEY TIRE, tires 2,197.70; TYLER TECHNOLOGIES, training 137.50; UPI, ethanol & diesel 8,145.52; VALLEY OFFICE, supplies 1,070.39; VALLEY SHOPPER, publishing 92.57; VERIZON WIRELESS, hot spot 38.52; VISA, gas, books, iPad 876.79; WHETSTONE HOME CENTER, supplies 121.94; WHETSTONE VALLEY ELECTRIC, primary rental, electricity 1,131.79; XEROX, copier rent 743.89. TOTAL: $74,917.38.

SD ATTY GENERAL, 24/7 PART FEE & SCRAM 278.00; SDACO, ROD MODERIZATION FEE 254.00. TOTAL: $532.00.

Bill Tostenson asked to address the Commission on wind energy tax credits at the Federal level.

It is the policy of Grant County, South Dakota, not to discriminate against the handicapped in employment or the provision of service.

The next scheduled meeting dates will be March 27 (Special Meeting) and April 3, 10 (Equalization) and 17, 2018 at 8 AM. Motion by Mach seconded by Stengel to adjourn the meeting. Motion carried 5-0. Meeting adjourned.

_____ _____

Karen M. Layher, Grant County Auditor Marty Buttke, Chairman, Grant County Comm.



003810

The revenue estimates for school districts, as presented by Apex Clean Energy, fail to take into account the reality of public K-12 school funding in South Dakota. The revenue estimates they presented assume that public school districts are allowed to keep 100% of the tax revenues generated from wind farms in addition to the full amount of funding they would be otherwise entitled to receive from the state. While this was once the case, recent changes in K-12 public education funding laws now eliminate this possibility.

Two years ago, our state legislature passed an additional half-cent sales tax primarily to increase revenues for K-12 teacher salaries. However, in addition to this revenue measure, the legislature also passed a series of fiscal accountability measures that radically reduce the financial benefit any public school district would receive from projects such as the wind farm proposed for our area. The first measure is an "other revenues" equalization measure. The purpose of this measure is to redistribute tax revenues generated from sources other than property tax levies (ex. revenues generated from wind farms, oil pipelines, natural gas pipelines, etc.) in order to prevent any one school district from having a financial advantage over another school district.

According to this measure, a school district would be allowed to keep 100% of its share of the tax revenues generated by a new wind farm project for the first five years of the project. During the second five years of the project's life span, these revenues are slowly reduced via a sunset provision: In Year 6, the district receives a reduction in its state aid that is equivalent to 20% of the revenues generated by the wind farm; in Year 7 the reduction is increased to 40%; in Year 8 it is increased to 60%; and so on until finally, in Year 10, every single cent that the school district receives from the wind farm is offset by a matching reduction in its state aid. The end result is a zero-sum impact on the school district's revenues.

The second measure is a cap on the amount of money the school district can retain in its general fund reserves. Depending on the number of students enrolled in school, a district's general fund reserve balance is capped at either 25%, 30%, or 40% of its general fund budget in any given year. If a district exceeds this amount in its general fund reserves, its state aid is reduced, dollar for dollar, by that excess amount. The revenues generated by a wind farm are considered general fund revenues, and would count against this overall reserve cap. During the years in which a school district would actually realize increased revenues from a wind farm, the district must also find a way to spend that money within that same fiscal year in order to avoid the penalty for exceeding the reserve cap. However, because this revenue source will eventually die (as described above), the district must find a way to spend that money without creating an annual expense.

In short, in order for a school district to be able to realize the financial benefit that has been advertised by companies such as Apex Clean Energy, South Dakota would have to drastically revise its public education funding laws and remove provisions such as the two described above.

Jon Meyer, Superintendent

Waverly-South Shore School
319 Mary Place
Waverly, SD 57201
605-886-9174

Industrial wind farms a hor... | South Australian Wind Tur... | mauersberger.pdf
www.puc.sd.gov/commission/dockets/electric/2018/EL18-003/mauersberger.pdf
NUSense
Most Visited Facebook DRUDGE REPORT 2016... Zero Hedge | On a lon... Breitbart News Network Amazon.com: Online ... AmazonSmile Strandburg Weather - ... 7-Day Forecast for Lati... Suggested Sites Web Slice Gallery Getting Started
20 of 21 Automatic Zoom

In addition, the Project represents an approximately $400 million investment in Grant and Codington Counties. Dakota Range would pay taxes on the Project, which would significantly increase the revenue available for a variety of local needs. A breakdown of the projected tax revenue distribution is provided below (see also Table 21-3 in the Application):

Projected Tax Revenue for the Dakota Range Project

Recipient	Annual Tax Revenue (Approximate)	Total Tax Revenue (Approximate)
Codington County	$80,000	$2,000,000
Leola Township	$6,000	$150,000
Germantown Township	$30,000	$700,000
Grant County	$280,000	$6,900,000
Lura Township	$25,000	$600,000
Mazeppa Township	$90,000	$2,300,000
Waverly School District	$225,000	$5,600,000
Summit School District	$280,000	$7,000,000
South Dakota	$420,000	$10,600,000

Additionally, over the expected 25-year life of the Project, the Project would generate approximately $39 million in lease payment to Project landowners, and approximately $17 million in wages paid to approximately 10 full-time operations and maintenance employees. Thus, the Project is anticipated to provide significant economic benefits locally, as well as within the State.

4:23 PM 3/27/2018

NORTH DAKOTA CENTURY CODE SECTION 17-04-06: THE FIRST STEP TOWARD A LEVEL PLAYING FIELD FOR WIND PROJECTS AND RURAL LANDOWNERS

COLLEEN J. RICE*

ABSTRACT

This article prepares the reader to engage in the ongoing debate concerning mitigating wind projects' competitive advantage with respect to wind easements and wind energy leases. The 2009 North Dakota legislature addressed this issue by passing North Dakota Century Code (N.D.C.C.) Section 17-04-06 and requiring that a 2009-2010 interim wind easement study be conducted to generate and offer recommendations to the 2011 legislature.

First of its kind in the nation, N.D.C.C. section 17-04-06 began leveling the playing field between rural landowners and wind projects by requiring two negotiation protocols and the inclusion of wind easement terms that prevent certain project risks being shifted to landowners. Although the playing field remains unlevel, wind projects are no longer allowed to distribute patently unfair wind easements and leases in North Dakota.

The article begins by explaining how wind projects gain and cultivate competitive advantage over rural landowners. The North Dakota legislature's authority, responsibility, and past practice of mitigating unfair competitive advantage are discussed next. The legislative history of N.D.C.C. section 17-04-06 and its attempt to mitigate the competitive advantage of wind projects is then reviewed. The article concludes with a suggested approach for establishing a solid foundation on which to complete mitigation efforts during the 2011 legislative session.

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*B.S., North Dakota State University, 1978; B.S., Valley City State College, 1980; J.D., University of Minnesota, 1983. Ms. Rice was a partner at Dosland, Nordhaugen, Lillehaug, Johnson and Saande in Moorhead, Minnesota until 1995 when she moved to Las Vegas, Nevada. She practiced in-house at NV Energy (formerly, Nevada Power Company), an investor owned electric utility, from 1995 until 2009 and served as its interim General Counsel during 2005 and 2006. This article is dedicated to the memory of my father Leonard Sannes, North Dakota farmer extraordinaire. Ms. Rice served as chief advocate of H.B. 1509 and testified before the North Dakota Legislature.

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I. INTRODUCTION

An important stakeholder in wind generating projects is often overlooked as state lawmakers pass legislation supporting this growing industry.[1] The overlooked stakeholder owns the land on which wind projects are built. Because project economics seldom allow construction on purchased land, long-term wind easements and wind energy leases grant projects necessary wind exposure rights while also establishing the ground rules for two separate enterprises, one agrarian and the other energy production, to exist side by side.

House Bill 1509[2] asked the 2009 North Dakota legislature to acknowledge and address the competitive advantage held by wind project

1. *See* N.D. CENT. CODE § 17-04-06 (2009) (recognizing that all other legislation related to wind energy passed during the 2009 North Dakota legislative session served the needs of wind projects). The 2009 North Dakota legislature extended availability of the reduced property tax assessment formula for certain wind towers. *Id.* § 57-06- 14.1. It also extended wind project sales and use tax exemptions. *Id.* § 57-39.2-04.2; § 57-40.2-04.2. Further, it extended income tax credits for installing wind facilities. *Id.* § 57-38-01.8. Lastly, it clarified that wind projects only need to receive either a certificate of site compatibility or conditional use permit and have an active transmission interconnection request pending to satisfy the five year development deadline. *Id*. §§ 17-04-01, -03, -05. As introduced, Senate Bill No. 2245 would have required that wind turbines be constructed within five years. S.B. 2245, 61st Leg. Assem. (N.D. 2009). Bills that focused on landowner issues were generally less successful. The attempt of House Bill No. 1426 to establish setback requirements for wind turbines failed to pass the House. H.B. 1426, 61st Leg. Assem. (N.D. 2009). Other important landowner issues were tabled until 2011. The Legislative Council received assignments to study and make recommendations to the 2011 legislature on both the issue of wind rights allocation—see H.C.R. 3044, 61st Leg. Assem. (N.D. 2009)—and the desirability of regulations to address the impact of wind projects on the environment and the future development of other natural resources—see H.B. 1449, 61st Leg. Assem. (N.D. 2009).

2. H.B. 1509, 61st Leg. Assem. (N.D. 2009).

developers with respect to wind easements and wind energy leases.[3] The wind industry actively lobbied against House Bill 1509, and negotiations resulted in the compromises codified in N.D.C.C. section 17-04-06[4] and a requirement that a 2009-2010 interim wind easement study be conducted to generate and offer recommendations to the 2011 legislature.[5]

First of its kind in the nation, section 17-04-06 did not level the playing field but it did prevent wind projects from using their competitive advantage to distribute patently unfair wind easements. Its requirements include two negotiation protocols[6] and the inclusion of wind easement terms that prevent certain project risks being shifted to landowners.[7]

This article prepares the reader to engage in this ongoing debate. It begins by explaining how wind project developers gain and cultivate competetive advantage over rural landowners. The legislature's authority, responsibility, and past practice of mitigating unfair competitive advantage is discussed next. The legislative history of section 17-04-06 and its attempt to mitigate the competitive advantage of wind projects is then reviewed. The article concludes with a suggested approach for establishing a solid foundation on which to complete mitigation efforts during the 2011 legislative session.

II. WIND PROJECT DEVELOPERS HAVE COMPETITIVE ADVANTAGE OVER RURAL LANDOWNERS

The competitive advantage that wind project developers have over rural landowners with respect to wind easements arises from several factors indigenous to rural North Dakota, and is preserved and cultivated by developers' negotiating tactics. Both sources of competitive advantage are discussed below.

A. SOURCES OF WIND PROJECT COMPETITIVE ADVANTAGE INDIGENOUS TO RURAL NORTH DAKOTA

Rural landowners are not in the wind generation business, but wind projects are. This simple fact is the first source of wind project competitive advantage. It is axiomatic that he who has the most information about a

3. "Wind easements" and "wind energy leases," referred to individually in North Dakota Century Code sections 17-04-02 and -05, are sufficiently similar for purposes of this article to hereafter be collectively referred to as "wind easements."

4. N.D. CENT. CODE § 17-04-06, *available at* http://www.legis nd.gov/cencode/t17c04.pdf.

5. H.B. 1509, 61st Leg. Assem., § 2 (N.D. 2009) (enrolled), *available at* http://www.legis.nd.gov/assembly/61-2009/bill-text/JBSB0500.pdf.

6. N.D. CENT. CODE § 17-04-06(1)(a)-(b) (2009).

7. *Id.* §§ 17-04-06(1)(e)-(g), (i).

complex transaction also has competitive advantage, and the wind industry's global giants are party to most North Dakota wind easements.

The American Wind Energy Association (AWEA), a national trade association representing wind power project developers and others involved in the wind industry,[8] reports that North Dakota has twenty-six wind projects existing or under construction, with a total capacity of 1,175 megawatts (MW) of energy.[9] AWEA also reports that three of the wind industry's largest companies, NextEra Energy Resources LLC (formerly FPL Energy LLC), ACCIONA Energy, and Iberdrola Renewables, own all or part of fifteen of these projects.[10] Their fifteen projects constitute 82% (996.2 MW) of the total wind capacity in existence or under construction in North Dakota.[11] Taking a closer look at these companies reveals who has been at kitchen tables across North Dakota negotiating the vast majority of wind easements for existing projects.

NextEra Energy Resources (NextEra) was the largest owner and operator of wind generating facilities in North America as of 2008.[12] NextEra had sixty-five wind projects comprised of more than 8,200 individual wind turbines operating in sixteen states and Canada, with an installed capacity of nearly 6,400 MW of electricity.[13] NextEra planned to add more than 1,000 MW of wind generation to its portfolio in 2009 and has approximately 28,000 MW in its wind-development pipeline.[14] NextEra had adjusted earnings of $821 million in 2008[15] and its corporate parent, FPL Group, Inc., reported 2008 revenues of more than $16 billion.[16] As a point of reference, North Dakota's Tax Commissioner projects that the state's total tax revenue for the 2007-2009 biennium will be $2.682 billion.[17]

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8. About AWEA, http://www.awea.org/about/ (last visited Apr. 14, 2010).

9. U.S. Wind Energy Projects—North Dakota (as of 6/27/2009), http://www.awea.org/projects (last visited Apr. 14, 2010). One MW of wind generation is considered sufficient to provide electricity to 225 to 300 homes. Wind Web Tutorial, Wind Energy Basics, http://www.awea.org/faq (last visited Apr. 14, 2010).

10. U.S. Wind Energy Projects—North Dakota (as of 6/27/2009), *supra* note 9.

11. *Id*.

12. FPL Group, About Us—NextEra Energy Resources, http://www fplgroup.com/about/contents/fple.shtml (last visited Apr. 14, 2010).

13. *Id*.

14. *Id*.

15. *Id*.

16. FPL Group: Profile—Energy Solutions for the Next Era, http://www fplgroup.com/reports/contents/2008profile.shtml (last visited Apr. 14, 2010).

17. North Dakota State and Local Taxes: An Overview and Comparative Guide (2008), http://www nd.gov/tax/genpubs/2008-redbook.pdf (last visited Apr. 14, 2010).

ACCIONA Energy has been pioneering renewable energy for nearly twenty years[18] and is ranked globally as a leading wind project developer and constructor;[19] it is also among the world's top wind turbine manufacturers.[20] ACCIONA Energy is a subsidiary of ACCIONA S.A., a 100 year-old, multi-billion-dollar company that is publically traded in Spain and has more than 40,000 employees working on operations located in thirty countries on five continents.[21]

Iberdrola Renewables is the worldwide leader in wind power with 9,300 MW in operation globally and 2,800 MW of that located in the United States.[22] It entered the American market in 2006, and by 2009 was the second largest provider of wind power after investing $3.74 billion during 2007 and 2008.[23] Iberdrola Renewables has the financial backing of its ultimate corporate parent, Iberdrola, S.A., Spain's number one energy group and the fourth largest utility company in the world by market cap.[24] Iberdrola, S.A. has been in business for 107 years and currently has 33,000 employees located in more than forty countries.[25]

Renewable Energy Systems Americas (RES Americas) is another large international wind energy company active in North Dakota.[26] RES Americas is a subsidiary of RES Group which is headquartered in the United Kingdom and has a long history of developing, constructing, and owning wind projects.[27] RES Group has about eighty-nine wind projects located around the world with a capacity of more than 4,911 MW, of which 3,799 MW were constructed or are under construction by RES Americas.[28] RES Americas' current North Dakota operations include measuring wind

18. ACCIONA North America—About Us, http://acciona-na/.com/About-Us.aspx (last visited Apr. 14, 2010).

19. ACCIONA North America—History, http://acciona-na/.com/About-Us/History.aspx (last visited Apr. 14, 2010).

20. *Id*.

21. ACCIONA North America—About Us, *supra* note 18; ACCIONA North America—History, *supra* note 19.

22. Iberdrola Renewables—Who We Are—Fact Sheet, http://www.iberdrolarenewables.us/pdf/iberdrola-renewables-fact-sheet-032309.pdf (last visited Apr. 14, 2010).

23. *Id*.

24. *Id*.

25. *Id*.

26. About RES Americas, http://www res-americas.com/about-us/res-americas.aspx (last visited Apr. 14, 2010); Glacier Ridge Wind Project, Home, http://glacierridgewind.com/ (last visited Apr. 14, 2010).

27. About RES Americas, *supra* note 26.

28. *Id*.

speeds at strategic locations[29] and jointly developing the 400 MW Glacier Ridge Wind Project located in Barnes County.[30]

A second factor contributing to wind projects developers' competitive advantage is the large geographic size of commercial wind projects. North Dakota's commercial wind projects vary in size but, as an example, Glacier Ridge is expected to span 30,000 acres.[31] The large geographic size of North Dakota wind projects means that developers will need wind access rights from several landowners in order to have a viable project. Efficiency requires that wind projects develop a standard uniform wind easement to be distributed to every interested land owner within the potential project's footprint.

Form wind easements increase projects' competitive advantage because project sales staffs typically argue that they can't negotiate changes to the form. Form contracts wouldn't be form contacts if wholesale edits were allowed, but landowner reluctance to request changes appears to be a trend given the title of the cover article chosen by the North Dakota Farmer's Union for its April 2008 issue of *Union Farmer*, "Landowners, Wind Farm Developers Can Negotiate."[32] Any trusting landowner who signs a form wind easement containing unfair terms makes it more difficult for his neighbors to negotiate changes.

Another boon to wind project competitive advantage is rural landowner reluctance to hire legal counsel. Like small businesses everywhere, hiring a lawyer to review contracts is rarely in the typical farmer or rancher's budget. But there are additional reasons indigenous to rural North Dakota that explain why rural landowners are unlikely to have contracts reviewed by attorneys.

Physical distance to a lawyer's office is perhaps one reason why legal counsel is often not obtained. According to the State Bar Association of North Dakota, there are only thirteen North Dakota cities home to more than six lawyers.[33] Many landowners would therefore have to travel eighty miles to reach a small general practice law firm.

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29. Glacier Ridge Wind Project, FAQs, http://glacierridgewind.com/faqs (last visited Apr. 14, 2010).

30. Glacier Ridge Wind Project, Home, *supra* note 26. The Glacier Ridge project does not appear on the AWEA list of North Dakota wind projects discussed above because it is still in the development stage.

31. Glacier Ridge Wind Project, FAQs, *supra* note 29.

32. Bob Kjelland, *Landowners, Wind Farm Developers Can Negotiate*, UNION FARMER, Apr. 2008, at 1.

33. North Dakota Lawyers Directory—Licensed Lawyers by North Dakota Cities, http://www.ndcourts.com/ (follow "Lawyers" hyperlink; then follow "Cities" hyperlink).

The enhanced level of trust typical in rural business relationships is another reason why rural landowners seldom seek legal counsel. Doug Burgum, North Dakota entrepreneur, founder of Great Plains Software, and former senior vice president of Microsoft Business Solutions, explains that he learned the role of trust in rural business relationships from his father who owned a grain elevator in Arthur, North Dakota.[34] Burgum said, "The thing he taught me about the relationship between a business and its customers is it's absolutely, positively based on trust . . . . What he taught me is if you screw grandpa, 50 years later his grandkid won't bring you his grain. Families remember that."[35]

In rural business relationships, there is a strong tendency to rely on trust to bridge any gaps in one's understanding of a transaction. This approach is reasonable when there are limited numbers of businesses requiring repeat customers, but rural landowners must understand that a wind project asking for a single transaction that will bind their land for generations does not deserve the same level of trust that is placed in area elevators and local businesses.

And even if a North Dakota landowner retains an attorney, that attorney may lack the expertise in wind easement issues needed to close the gap created by the wind project's competitive advantage. There are thirty-eight rural towns in North Dakota with only one lawyer and another twenty towns with two or three lawyers.[36] Although closest in proximity to the landowners being approached by wind projects, these practitioners must already stay abreast of a heroic number of practice areas. It may be too much to ask that they also level the playing field between local landowners and the world-class companies negotiating most of the state's wind easements.

North Dakota lawyers experienced in representing landowners with respect to wind easements are not easy to find. For example, in November 2009, the State Bar Association of North Dakota Lawyer Referral and Information Service was unable to refer a landowner to an attorney experienced in wind easements or leases.[37] A November 2009 search at martindale.com

34. Barbara Darrow, *Burgum Reflects On His Past And MBS' Future*, CHANNEL WEB, Mar. 31, 2006, http://www.crn.com/software/184417383.

35. *Id*.

36. North Dakota Lawyers Directory—Licensed Lawyers by North Dakota Cities, *supra* note 33.

37. I spoke with the State Bar Association of North Dakota Lawyer Referral and Information Service on November 17, 2009, and learned that its lawyer referral software does not include a category for "wind easements and leases," preventing them from tracking lawyers interested in receiving such referrals. The Lawyer Referral and Information Service representative said that

for North Dakota lawyers experienced in "wind energy" also yielded no results. Changing the martindale.com query to "renewable energy" yielded the name of one North Dakota lawyer,[38] but his firm's website indicated that its renewable practice was focused on representing developers.[39]

Last on this illustrative list of indigenous sources of wind project competitive advantage is the ethereal nature of wind. Wind's invisibility breeds the inaccurate sales pitch that landowners are "getting something for nothing" when they sign a wind easement. Although wind easement payments are touted as "free money," this view ignores both the fact that wind has become a valuable commodity and the possibility that wind easements may transfer significant legal risk to landowners.

B. WIND PROJECTS CHOOSE NEGOTIATING TACTICS THAT PRESERVE AND CULTIVATE THEIR COMPETITIVE ADVANTAGE

The competitive advantage held by developers not only results from the indigenous factors of rural life discussed above, but also from intentionally chosen tactics, including their penchant for confidentiality and several contracting strategies discussed below. Confidentiality requirements are probably the most potent tactic developers employ to protect and enhance their competitive advantage. One strategy requires landowners to sign confidentiality agreements as a prerequisite to receiving the form wind easement. The project thereby gains competitive advantage by isolating the landowner on a virtual island, denying him access to information from which to rebut a project's position that the form contract is non-negotiable.

Another effective way project developers use confidentiality requirements to cultivate competitive advantage is to draft confidentiality obligations into final executed wind easements that protect the contract terms from being disclosed. Confidentiality requirements are rarely a "deal breaker" for the individual landowner, but collectively these confidentiality requirements cultivate wind project competitive advantage in at least three important ways.

First, keeping wind easements confidential hinders the educational efforts of state government through its universities and agricultural agencies, as well as by organizations like the Farm Bureau and Farmer's Union. If one cannot learn the terms of North Dakota's wind easements, it is

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they expect to receive authorization to upgrade their software soon and will then be able to register lawyers interested in this practice area.

38. Martindale-Hubbell, http://www martindale.com (entering "renewable energy" for "Practice Area" and "North Dakota" for "State/Province" in the "Find Lawyers & Firms" search).

39. Fredrikson & Byron, P.A.: Energy, http://www fredlaw.com/areas/energy/index html.

impossible to pinpoint issues, spot trends, and prepare educational materials focused on North Dakota's issues.

Second, confidential wind easements hinder lobbying efforts on behalf of rural landowners. Groups with legitimate interests in protecting rural America like the Farm Bureau and Farmer's Union are prevented from obtaining the best, most accurate information and are therefore disadvantaged when lobbying wind easement related issues. Even legislators who want to find out how their constituents are being treated by wind projects are stymied by their constituents' inability to provide details.

Third, keeping wind easements confidential makes it virtually impossible for landowners to find out what "market" terms are for wind easements, denying them a typical and often potent negotiation strategy. For example, if a landowner wants to know the market rate for cash renting farmland, a county extension agent can likely tell him and the information can be used during lease negotiations. But a North Dakota landowner has no source of accurate information if he wants to know what typical terms are for North Dakota wind easements or how North Dakota wind easement terms compare with terms given in other states. North Dakota lawyers beginning to practice in the area of wind easements will have the same difficulty learning what market terms are for wind easements. In contrast, large wind project companies and their lawyers know the range of what the various markets will bear by virtue of the number of wind easements they enter into in North Dakota and across the country.

This disparity in knowledge of market terms generates competitive advantage because wind projects are allowed to distribute below market wind easements in North Dakota with relative impunity.[40] Rural landowners and their attorneys lack the information to persuasively argue that the terms are not market, nor can they rebut wind project claims that the terms are market for North Dakota. In addition, however, the legislative history of House Bill 1509 evidences an apparent attempt by wind projects to artificially lower the bar on what market wind easement terms are in North Dakota.[41] Conference committee minutes reference a trend that North

40. *See* discussion *infra* Part IV. The terms of a North Dakota wind easement that the author considers blatantly unfair will be contrasted with the terms of a wind easement used in Texas. *Id.*

41. HOUSE BILL AND RESOLUTION HISTORY—STANDING COMMITTEE MINUTES, H.B. 1509, 61st Leg. Assem., at 43, 37-38 (N.D. 2009) (comment of Sen. David Houge), *available at* http://www.legis nd.gov/assembly/61-2009/bill-status/house/HB1509.PDF. [hereinafter HOUSE BILL AND RESOLUTION HISTORY].

> The problem that's unique to this [wind power] industry is that the landowner doesn't have the same negotiating power the mineral owner has. The mineral developer is going to go where the petroleum is. What we've seen with the wind developer is they tend to pick the soft targets. If you want to negotiate with them they tend to go around

Dakota wind developers are primarily pursuing "low hanging fruit;" for example, landowners who do not try to negotiate wind easements.[42] Without regulation, wind companies cannot be expected to distribute wind easements that adequately protect the landowners' interests and a predominance of un-negotiated wind easements would effectively result in market terms for North Dakota's wind easements that are more advantageous to wind projects than would otherwise occur.

The contracting process by which wind projects acquire wind easements also enhances their competitive advantage. The wind easement is the last in a series of contractual commitments a developer needs from a landowner. The wind easement is also the most important and complicated of these commitments because it is the source of any substantive monies possibly paid to the landowner, and it sets forth the ground rules for the wind operation and agrarian operation to coexist. Instead of approaching this series of commitments methodically, wind projects prefer to commingle the commitments into one transaction, an approach that benefits the wind project.

The first contractual commitment a wind project needs from a landowner is an option to subsequently enter into a wind easement. The option requires the developer to pay the landowner a nominal amount to refrain from negotiating with other wind companies so that the contracting project has time to conduct the due diligence needed to determine if the site is viable for a wind project, and if so, to create a business plan to develop the project.

In addition to an option, the wind project will secondly need access to the landowner's property in order to complete its due diligence. For example, the wind project may need access to the property in order to install and regularly monitor a device that records the property's wind characteristics. Access rights could be provided most simply via a short-term lease or license agreement but are typically inserted into the option.

Third, should due diligence confirm that the wind project is viable, the project owner will need to exercise the option and enter into a long-term wind easement with the landowner. Although the wind easement could be a free-standing agreement negotiated after the project is known to be viable, either the form wind easement or its key terms will most typically be part of the option.

> you and go to the next track of land that will not be as willing to negotiate. Within certain parameters they can locate their wind towers where they can find a low hanging fruit.

Id.

42. *Id*.

Commingling all three contractual commitments into one transaction requires the landowner to promptly make an all or nothing decision—whether to have a long term business relationship with the wind project developing a project in his area or, alternatively, run the risk of experiencing the sight and sound of wind turbines without any remuneration. The length of the "getting to know you stage" varies with the wind project; some companies make an effort to establish a relationship and others apply pressure for a quick decision[43] resulting in some landowners being forced into deciding whether to marry a "blind date" or alternatively, run the risk of never getting "married."

Making the effort to reach a well-considered decision may be wasted if the project is proven not viable, or if viable, the landowner's property is not chosen to host wind towers. Even if the landowner takes the time to gain expertise and spends the money to negotiate the agreement, early contracting requires the landowner to evaluate the transaction wearing blinders because the location of wind turbines and other project facilities will not be known yet. There are generally no guaranties that wind towers will be placed on a landowner's property and therefore even landowners who sign wind easements risk a future of living with his neighbors' turbines while receiving the minimal compensation paid for access roads and transmission lines.[44]

Another standard tactic used by wind projects to enhance their competitive advantage is to send employees or agents to landowners' homes to both discuss and close proposed transactions.[45] The danger of contracts being signed around kitchen tables is well recognized; it is difficult to exercise the same level of professional skepticism while serving coffee and cookies.

Wind projects sometimes include a person who is well-respected in the community on their team of people sent to landowners' homes.[46] This is a

43. HOUSE BILL AND RESOLUTION HISTORY at 48-49. The legislative history of House Bill 1509 tells of some developers who hold community meetings designed to share information and others who offered a signing bonus if a landowner committed within fifteen days. *Id.*

44. This typical contracting process may also discourage lawyers from actively pursuing a wind easement practice. The legal costs associated with completely understanding the transaction and negotiating changes, many of which will be focused on limiting risk, will be the same even if the landowner ultimately receives nothing more than the nominal option payment or minimal payments for access to roads and transmission lines. Although it is the client's money that will be wasted in the short term, the attorney, especially one in a small community, faces the longer term risk of a dissatisfied client.

45. HOUSE BILL AND RESOLUTION HISTORY, *supra* note 41, at 88. The legislative history of House Bill 1509 evidences that this approach is being used in North Dakota. *Id.*

46. *Id.* The legislative history of House Bill 1509 evidences that this approach is being used in North Dakota. *Id.*

powerful tactic that enhances the risks associated with kitchen table negotiations. The local person may be a co-developer, an individual hired for this purpose or a supportive recruit who has already signed a wind easement. The presence of the native son breaks the ice, but more insidiously, encourages the landowner to superimpose the local person's credibility and trustworthiness onto the wind project.

This list of wind project negotiating tactics is not intended to be complete but attempts to highlight those whose shrewdness makes them less visible. Other more blatant negotiating techniques are also relied upon. These include standard high pressure tactics of refusing to negotiate changes to the form wind easement and insisting that the landowner act promptly.[47]

This combination of factors and tactics enhances the competitive advantage of wind projects such that the descent of their sales staff onto a rural community can be considered akin to the New York Yankees challenging the local 4-H club softball team to a game. Only the stakes are much higher.

III. LEGISLATION MITIGATING THE COMPETITIVE ADVANTAGE OF WIND PROJECTS IS JUSTIFIED

The North Dakota legislature does not have to stand idle while wind project developers visit kitchen tables across the state. Continuing the above analogy, the legislature can enact new game rules to even the odds between the local 4-H club and the Yankees. This section first reviews the legislature's authority and past practice of mitigating unfair competitive advantage by inserting legislation into the contracting processes of other industries, and then summarizes the legislative history of N.D.C.C. section 17-04-06.

A. LEGISLATURE'S AUTHORITY AND PAST PRACTICE OF MITIGATING COMPETITIVE ADVANTAGE

North Dakota's state government was instituted "for the protection, security and benefit of the people[.]"[48] Although the legislature is not in the business of drafting contracts for its constituents, the North Dakota legislature has inserted legislation in various ways into a variety of contracting processes by virtue of its authority and responsibility to protect, secure and benefit the public.

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47. *Id.* at 38, 43, 49, 77, 80. The legislative history of House Bill 1509 is also replete with evidence that such approaches are being used in North Dakota. *Id.*

48. N.D. CONST. art. I, § 2, *available at* http://www.legis nd.gov/constitution/Const.pdf.

One tack the legislature has taken is setting an outer boundary for a specified contract term and reinforcing that boundary with stiff penalties. This was how the legislature mitigated the ability of lenders to use their competitive advantage to charge excessive interest rates.[49] A statutory formula set the usurious interest rate.[50] Should a lender ignore this requirement, penalties include refunding twice the amount of interest paid plus 25% of the principal to the borrower[51] and being charged with a class B misdemeanor.[52]

A second approach declares a certain contract term void as against public policy. This approach was used to further mitigate lenders' competitive advantage, specifically their ability to require that borrowers sign loan documents obligating the borrower to pay the lender's attorney's fees in the event of a collection action.[53] Instead of prohibiting lenders from including such provisions in their loan instruments, the legislature declared such provisions void as against public policy.[54]

The legislature has also proactively drafted a damages provision and required that it be inserted into mineral leases that were silent on the subject.[55] This required clause specifies the circumstances giving rise to damages, requires the parties to mutually agree on the damages formula, and sets December 31 as the annual due date.[56] And to guaranty that the competitive advantage of mining companies did not interfere with its intent, the legislature clarified that these rights were "absolute and unwaivable" and that "[a]ny instrument which purports to waive rights granted by this section is null and void and of no legal effect."[57]

The legislature required special negotiating protocols when mitigating the power of companies acquiring coal leases.[58] For example, when coal

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49. N.D. CENT. CODE ch. 47-14 (2009), *available at* http://www.legis nd.gov/cencode/t47c14.pdf.

50. *Id.* § 47-14-09(1).

51. *Id.* § 47-14-10.

52. *Id.* § 47-14-11.

53. *Id.* § 28-26-04 (2005), *available at* http://www.legis nd.gov/cencode/t28c26.pdf.

54. *Id.* The law explains that

> [a]ny provision contained in any note, bond, mortgage, security agreement, or other evidence of debt for the payment of an attorney's fee in case of default in payment or in proceedings had to collect such note, bond, or evidence of debt, or to foreclose such mortgage or security agreement, is against public policy and void.

Id.

55. *Id.* § 38-18-07(1) (2004), available at http://www.legis.nd.gov/cencode/t38c18.pdf.

56. *Id.*

57. *Id.* § 38-18-07(3).

58. *See id.* ch. 38-17, *available at* http://www.legis nd.gov/cencode/t38c17.pdf.

leasing companies include an "advance royalty"[59] provision in their coal leases, they are required to follow this procedure: before execution, the clause must be "specially explained" to the surface owner and the surface owner must sign an acknowledgement in the format required by the legislature.[60] The penalty for not following this procedure is that the advance royalty provision is deemed void.[61]

Instead of focusing on contractual terms, a fifth approach provides a window of opportunity to cancel an executed contract. In another attempt to mitigate the competitive advantage of coal mines, parties to coal leases are allowed fifteen business days after execution to terminate them without penalty.[62]

A comprehensive package of protections targets the competitive advantage of those soliciting contracts for the sale or lease of consumer goods or services around kitchen tables, and other places that are not the solicitor's place of business.[63] The threat of this contracting approach is considered so severe that protection is triggered when the price of the contract amounts to just $25.00.[64] A three business day window of opportunity—potentially fifteen business days if the individual is sixty-five years or older and the purchase price is more than fifty dollars—is allowed to cancel the contract.[65] In addition, bonuses for referrals are regulated,[66] covered contracts must contain a required notice provision,[67] and a person is guilty of a class B misdemeanor for any violations of the chapter.[68]

The legislature used a global approach to mitigate the insurance industry's competitive advantage. Regulatory authority was first delegated to the Insurance Commissioner and then reinforced with numerous dictates regarding the content of insurance policies.[69] Insurance companies cannot even issue a new form contract without first seeking the approval of the

59. "'Advance royalty' means the offset contemplated which would allow payments for rent, bonuses, and damages under the terms of the lease to be deducted from the amount of the royalty due to the lessor when the mining operation actually begins." *Id*. § 38-17-03(1).

60. *Id.* § 38-17-06.

61. *Id.*

62. *Id.* § 38-17-04(2).

63. *See id.* ch. 51-18 (2007), *available at* http://www.legis nd.gov/cencode/t51c18.pdf.

64. *Id.* § 51-18-08(2).

65. *Id.* § 51-18-02(1).

66. *Id.* § 51-18-03.

67. *Id.* § 51-18-04.

68. *Id.* § 51-18-09. Despite the similar *modus operandi,* because wind easements do not involve consumer goods or services, this comprehensive system offers no protection to landowners approached by wind projects. *Id.* § 51-18-01(1), (3).

69. *Id.* tit. 26.1 (2009), *available at* http://www.legis nd.gov/cencode/t261 html.

Insurance Commissioner.[70] If approval is given, the Insurance Commissioner can later decide after a hearing to rescind its approval if the contract "contains a provision which is unjust, unfair, inequitable, misleading, or deceptive[.]"[71] It is instructive that the legislature did not just temper the insurance industry's competitive advantage, but created a construct that could fully mitigate it such that fair and just contracts would result.[72]

How an industry acquires its competitive advantage is not relevant to whether the legislature is authorized and obligated to mitigate it. Even if competitive advantage has been gained innocently, the question for the North Dakota legislature is whether it needs to be mitigated "for the protection, security and benefit of the people[.]"[73] In the case of wind projects and wind easements, the 2009 North Dakota legislature decided that the answer was "yes."

B. SUMMARY OF SECTION 17-04-06'S LEGISLATIVE HISTORY

As introduced, House Bill 1509 required the North Dakota Public Service Commission to adopt rules establishing a voluntary code of conduct for wind projects.[74] The North Dakota Farmers Union described the genesis of this approach as follows, "The bill [was] developed from feedback by a number of member organizations that expressed a need for landowner protections when dealing with wind developers. The initial concept was seen as a more palatable means of getting at the bigger issue which was fairness and transparency."[75]

On January 29, 2009, the House Natural Resources Committee heard testimony on House Bill 1509.[76] A representative of the North Dakota Public Service Commission testified that for several reasons the commission did not think it was the appropriate entity to create the code of conduct.[77] One of House Bill 1509's sponsors distributed copies of an article entitled *Landowner Guidelines for Evaluating Wind Energy Production*

70. *Id.* § 26.1-30-19(1).

71. *Id.* § 26.1-30-21(2).

72. *See id*.

73. N.D. CONST. art. I, § 2, *available at* http://www.legis nd.gov/constitution/Const.pdf.

74. H.B. 1509, 61st Leg. Assem. (N.D. 2009) (introduced), *available at* http:/www.legis. nd.gov/assembly/61-2009/bill-text/JBSB0100.pdf.

75. North Dakota Farmers Union, H.B. 1509, http://ndfu.org/addPages/index.asp?linkname= HB%201509.

76. HOUSE BILL AND RESOLUTION HISTORY, *supra* note 41, at 2-7, 65-83.

77. *Id*. at 82-83 (testimony of Illona A. Jeffcoat-Sacco, General Counsel to the Public Service Comm.).

Leases[78] to the committee.[79] The document was well received and the possibility of using it as a guide for a revised code of conduct was raised.[80] The author of this article also testified to the committee about a form wind easement my mother had received.[81]

The House Natural Resources Committee subsequently decided to significantly amend House Bill 1509 to replace the rulemaking approach with a more fulsome bill that served as a mandatory code of conduct.[82] As amended, House Bill 1509 unanimously passed the House on February 16, 2009.[83] Among other things, it required wind projects to draft wind easements in plain English,[84] include a cover sheet advising landowners to retain legal counsel,[85] and described required wind easement terms, several of which were suggested by *Landowner Guidelines for Evaluating Wind Energy Production Leases*,[86] including banning confidentiality clauses.[87]

On March 13, 2009, the Senate Natural Resources Committee heard testimony, including mine, on House Bill 1509.[88] According to the Farmers Union, "[a]s the bill moved to the Senate there was a significant increase in opposition from the Wind Developer lobby. Proponents worked with legislators and opponents of the bill to address concerns and the Senate amended the bill as it saw appropriate."[89] By a vote of 32 to 14, the full Senate passed the amended bill on April 7, 2009.[90]

Although the Senate amendments were relatively minor,[91] when House Bill 1509 went back to the House, chairman Todd Porter of the House

78. Stephen B. Harsh et al., *Landowner Guidelines for Evaluating Wind Energy Production Leases,* MICH. ST. U. DEP'T OF AGRIC., FOOD AND RESOURCE ECON., Feb. 2008, *available at* http://web1 msue msu.edu/wind/WindLease_WorkSheet.pdf (observing that an abbreviated version of this paper appeared in the April 2008 issue of the North Dakota Farmers Union UNION FARMER described at note 33 above).

79. HOUSE BILL AND RESOLUTION HISTORY, *supra* note 41, at 3, 67-74 (noting the article's distribution by Rep. Phillip Mueller).

80. *Id*. at 4.

81. *Id*. at 4, 75-78.

82. *Id*. at 12-14.

83. Measure Actions, H.B. 1509, http://www.legis nd.gov/assembly/61-2009/bill-actions/ba1509 html.

84. H.B. 1509, 61st Leg. Assem., § 1(1)(a) (N.D. 2009) (engrossed), *available at* http://www.legis nd.gov/assembly/61-2009/bill-text/JBSB0200.pdf.

85. H.B. 1509, 61st Leg. Assem., § 1(1)(b) (N.D. 2009) (engrossed), *available at* http://www.legis nd.gov/assembly/61-2009/bill-text/JBSB0200.pdf.

86. Harsh et al., *supra* note 78.

87. H.B. 1509, 61st Leg. Assem., § 1(1)(d) (N.D. 2009) (engrossed), *available at* http://www.legis nd.gov/assembly/61-2009/bill-text/JBSB0200.pdf.

88. HOUSE BILL AND RESOLUTION HISTORY, *supra* note 41, at 16-20, 86-102.

89. North Dakota Farmers Union, H.B. 1509, *supra* note 75.

90. Measure Actions, H.B. 1509, *supra* note 83.

91. HOUSE BILL AND RESOLUTION HISTORY, *supra* note 41, at 32-33. The Senate eliminated the requirements that wind easements be written in plain English and that the wind developer

Natural Resources Committee moved that the House not concur in the Senate amendments and that a conference committee be appointed.[92] The motion prevailed on a voice note.[93] It is important to note that the bill as it passed both houses banned confidentiality clauses in executed wind easements.[94] Once in conference committee, however, the Farmer's Union reported that "the issue of 'confidentiality' was at the heart of the opposition."[95] After intense negotiations lasting several days,[96] the conferees agreed to a compromise that allowed parties to mutually agree to confidentiality requirements in executed wind easements, but prevented this provision from covering negotiations or terms of proposed easements.[97]

The final version of House Bill 1509 passed the House on April 29, 2009, with a vote of 86 to 5;[98] passed the Senate on April 30, 2009, with a vote of 41 to 6;[99] was signed by the governor on May 4, 2009;[100] and was codified at section 17-04-06 with an effective date of August 1, 2009.

Although many North Dakotans are subject to wind easements executed before August 1, 2009, future opportunities for wind projects to use their competitive advantage are apparent from statistics ranking North Dakota first in wind power potential.[101] There are obviously many more North Dakota kitchen tables left for wind project developers to approach.

IV. THE SCOPE OF NORTH DAKOTA CENTURY CODE SECTION 17-04-06

Compromises resulting from intense negotiations of House Bill 1509 are apparent in section 17-04-06. Although it mandates the adoption of two

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waive subrogation actions against the landowner, changed the waiting period to ten days, added a requirement that the landowner make accommodations to the wind project during construction and operation, and refined the landowner's ability to terminate the agreement if the wind project stops operating. *Id.*

92. HOUSE JOURNAL, 61st Leg. Assem., 1422 (N.D. 2009), *available at* http://www.legis nd.gov/assembl/61-2009/journals/HR64.pdf.

93. *Id*.

94. H.B. 1509, 61st Leg. Assem., § 1(1)(c) (N.D. 2009) (first engrossment with Conference Committee Amendments), *available at* http://www.legis nd.gov/assembly/61-2009/bill-text/JBSB0300.pdf.

95. North Dakota Farmers Union, H.B. 1509, *supra* note 75.

96. HOUSE BILL AND RESOLUTION HISTORY, *supra* note 41, at 34-63.

97. H.B. 1509, 61st Leg. Assem., § 1(1)(c) (N.D. 2009) (first engrossment with conference committee amendments), *available at* http:/www.legis nd.gov/assembly/61-2009/bill-text/JBSB0400.pdf.

98. Measure Actions, H.B. 1509, *supra* note 83.

99. *Id*.

100. *Id*.

101. U.S. Wind Energy Projects—North Dakota (as of 6/27/2009), http://www.awea.org/projects (last visited Apr. 14, 2010).

negotiation protocols[102] and includes a short list of required wind easement terms that prohibit certain project risks being shifted to landowners,[103] it also requires contract terms that favor wind projects[104] and preserves the ability of wind projects to enhance their competitive advantage by insisting that executed wind easements contain confidentiality obligations.[105] All facets of section 17-04-06 are discussed below.

A. REQUIRED NEGOTIATION PROTOCOLS

1. *Wind Easements Must Have a Cover Page Encouraging Landowners to Retain Legal Representation*

Wind project developers are required to attach a cover page to wind easements that contains the following message to landowners in at least sixteen-point type:

> This is an important agreement our lawyers have drafted that will bind you and your land for up to __ years. We will give you enough time to study and thoroughly understand it. We strongly encourage you to hire a lawyer to explain this agreement to you. You may talk with your neighbors about the wind project and find out if they also received a proposed contract. You and your neighbors may choose to hire the same attorney to review the agreement and negotiate changes on your behalf.[106]

This paragraph sends an important message to landowners at the exact time they need to hear it—when they are around their kitchen table with wind project representatives. Just when the landowner may be hearing the siren call that trust can bridge any gaps in his understanding and that legal representation is not necessary, this paragraph attempts to provide an antidote.

Unfortunately, the cover sheet does not clearly protect the landowners' rights to discuss the terms of the proposed wind easement with others. Only discussions "about the wind project" and whether a neighbor "also received a proposed contract" are clearly protected.[107] Although an executed wind easement cannot contain provisions requiring either party to maintain

102. N.D. CENT. CODE § 17-04-06(1)(a)-(b) (2009), *available at* http://www.legis nd.gov/cencode/t17c04.pdf.

103. *Id.* § 17-04-06 (1)(e)-(g), (i).

104. *Id.* § 17-04-06 (1)(d), (1)(h), (2).

105. *Id.* § 17-04-06(1)(c).

106. *Id.* § 17-04-06(1)(a).

107. *Id.*

the confidentiality of negotiations or proposed terms,[108] there is no restriction on a separate confidentiality agreement being required to receive a proposed wind easement. This is an important oversight for the 2011 legislature to consider correcting.

2. *A Minimum of a Ten Business Day Waiting Period Before Wind Easements May be Executed*

Wind easements "[m]ay not be executed by the parties until at least ten business days after the first proposed easement or lease has been delivered to the property owner."[109] This requirement was in response to testimony, including mine, that landowners were willing to sign unread wind easements during the project's first visit to the kitchen table. I told the Senate Natural Resources Committee that until my mother intervened, my 91-year-old father was ready to commit to a wind easement without reading it when a representative of a wind project visited his kitchen table.[110]

The following testimony was not part of the House Bill 1509 hearings but graphically describes the benefit of a waiting period. The President of Peak Wind Development, LLC, a North Dakota limited liability company formed by a group of local landowners,[111] complained to the Federal Energy Regulatory Commission that FPL Energy (n/k/a NextEra) took the following approach when encouraging him and his neighbors to sign a wind easement.

> Mr. Kavenaugh [FPL Energy's representative] told our family that FPL Energy was developing a wind farm in the area that could be fourteen miles long and one and a half miles wide. Kavenaugh indicated that FPL Energy was offering $1,000 per year per landowner to retain development rights for five years; if a wind turbine was actually constructed, the landowner would receive $4,000 per year, but would have to commit to a 99-year lease. Mr. Kavenaugh said that the contracts needed to be signed within two days . . . .
>
> FPL Energy representatives gave my neighbors (many of them elderly and without legal representation) a hard sell, telling them that all their

108. *Id.* § 17-04-06(1)(c).

109. *Id.* § 17-04-06(1)(b).

110. HOUSE BILL AND RESOLUTION HISTORY, *supra* note 41, at 88.

111. Glacier Ridge Wind Project, Peak Wind LLC, http://glacierridgewind.com/peak-wind-llc (last visited Apr. 14, 2010). Peak Wind Development, LLC, has approximately 80 members and is co-developing the Glacier Ridge Wind Project with RES Americas. Glacier Ridge Wind Project, Home, http://glacierridgewind.com/index (last visited Apr. 14, 2010).

neighbors had signed (which was not true) and that they did not need to talk with their family or a lawyer.[112]

A ten business day waiting period mitigates these negotiation approaches,[113] but its protection is easily circumvented if wind projects begin delivering proposed easements by mail and following up with personal sales visits ten business days later. If such an approach is adopted, North Dakota landowners are no better off than before. Redefining what starts the ten day waiting period during the 2011 legislative session would help fill this loophole.

Alternatively, the waiting period could be replaced with a window of opportunity to cancel the wind easement akin to North Dakotans' ability to cancel $25.00 consumer contracts signed at their kitchen tables,[114] and their ability to cancel coal leases.[115] While waiting periods and cancellation periods both have pros and cons, one thing is clear: North Dakotans are today better protected from traditional "Avon ladies" than from sophisticated, multi-national wind energy companies with skilled sales staffs backed by world-class attorneys.[116]

B. REQUIRED WIND EASEMENT TERMS

Wind easement terms required by section 17-04-06 will be discussed in the context of two wind easements, one drafted for a North Dakota project and the other drafted for a Texas project. For convenience they will be referred to as the "North Dakota Easement" and the "Texas Easement." Given the history of wind project competitive advantage in North Dakota, it is important to compare North Dakota wind easements with wind easements from other states. Substantive disparities disadvantaging North Dakotans evidence that the power of wind projects' competitive advantage has been wielded more effectively in North Dakota.

The "North Dakota Easement" is the "North Dakota Wind Energy Option and Easement Agreement" prepared by RES North America Leasing,

112. Affidavit of William Noeske, ¶¶ 8,9, Attachment 1 to the Complaint of Renewable Energy Systems Americas Inc. and PEAK Wind Development, LLC v. Otter Tail Power Company and Minnkota Power Cooperative, Inc., FERC Docket EL08-86-000.

113. N.D. CENT. CODE § 17-04-06(1)(b).

114. *See Id.* § 51-18-02(1), *available at* http://legis nd.gov/cencode/t51c18.pdf (creating a 3 business day window to cancel a contract for consumer goods and potentially 15 business days if the individual is 65 years or older and the purchase price is greater than fifty dollars).

115. *Id.* § 38-17-04(2), *available at* http://legis nd.gov/cencode/t38c17.pdf (providing a 15 business day window to cancel).

116. Avon may choose to circumvent their customers' section 51-18-02 cancellation rights by offering a full section 51-18-08(7) return and refund privilege. *Id.* § 51-18-08(7), *available at* http://legis.nd.gov/cencode/t51c.18.pdf.

LLC, and provided to my mother in July 2008 without requiring that she sign a confidentiality agreement. Relevant portions were attached to my testimony to the Senate Natural Resources Committee.[117] This agreement was prepared for the Glacier Ridge project and RES Americas represented to me that it contained the form wind easement terms and conditions that about eighty neighbors had signed.

The "Texas Easement" is the "Wind Power Agreement" prepared by Nacel Energy Corporation (Nacel), a publicly traded Wyoming corporation engaged in the business of developing wind projects.[118] Nacel is currently developing six wind projects located in Texas and Arizona, including the Texas project governed by this Texas Easement. [119]

Nacel filed the Texas Easement with the Securities and Exchange Commission (SEC) as Exhibit 10.3 to Nacel's Form 10-K for fiscal year ending March 31, 2009.[120] The SEC does not require corporations to disclose information in their exhibits that meet the SEC's confidentiality standards.[121] Confidential portions of filed exhibits may be redacted pending resolution of a petition to the SEC seeking exemption from public disclosure.[122] Despite the availability of this procedure, Nacel filed the entire Texas Easement, even compensation terms, without redactions.[123]

1. *Required Wind Easement Terms that Prevent Wind Project Risk Being Shifted to Landowners*

a. Landowners are Protected from Property Tax Liability for Wind Facilities

Wind easements cannot include terms that make the landowner "liable for any property tax associated with the wind energy facility or other equipment related to wind energy generation."[124] This requirement is typically in wind easements and both of the easements referenced above contain it.[125]

117. HOUSE BILL AND RESOLUTION HISTORY, *supra* note 41, at 92-99.

118. Nacel Energy Corp., Annual Report (Form 10-k), at 4 (June 23, 2009), *available at* http://investing.businessweek.com/research/stocks/financials/drawFiling.asp?formType=10-K [hereinafter Nacel Form 10-k].

119. Nacel Energy, Our Projects, http://www nacelenergy.com/business/projects html (last visited Apr. 14, 2010).

120. Nacel Form 10-k, *supra* note 118, at Ex. 10.3.

121. Securities and Exchange Act of 1934, ch. 394, 48 Stat. 881 (Rule 24-b).

122. *Id*.

123. Nacel Form 10-k, *supra* note 118, at Ex. 10.3.

124. N.D. CENT. CODE § 17-04-06(1)(e) (2009), *available at* http://www.legis nd.gov/cencode/t17c04.pdf.

125. Nacel Form 10-k, *supra* note 118, at Ex. 10.3 § 6.3; HOUSE BILL AND RESOLUTION HISTORY, *supra* note 41, at 94.

This requirement still performs an important function, however; it prevents wind projects from using their competitive advantage to draft wind easements allowing them to escape this obvious responsibility.

b. Landowners are Protected From Liability for Damages Caused by Wind Projects

Wind easements are prohibited from making "the property owner liable for any damages caused by the wind energy facility and equipment or the operation of the generating facility and equipment, including liability or damage to the property owner or to third parties."[126] Two typical wind easement provisions affected by this requirement are crop loss and indemnity. Both are examined below.

Wind easements pertaining to agricultural property typically contain a crop loss provision obligating the wind project developer to reimburse the landowner for crop loss caused by the project at any time during the wind easement's term. Although this obligation is typical, the North Dakota Easement demonstrates why this statutory requirement is needed. The North Dakota Easement limited the wind project's obligation to pay damages for crop loss caused by the project to the period of "Construction Activities," a defined term referencing only the construction and erection of the wind facilities.[127] Therefore, during the balance of the 40 year term the wind project could damage the landowner's crops with contractual impunity. This inequity is now statutorily prevented.[128]

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126. N.D. CENT. CODE § 17-04-06(1)(f) (2009).

127. *See* HOUSE BILL AND RESOLUTION HISTORY, *supra* note 41, at 94-95. Section 9.3 of the North Dakota Easement addresses the repair of improvements and reimbursement for crop damages:

> (d) If Owner [landowner] has not planted a crop in the location of improvements for the growing season in which the improvements will be constructed, Owner shall not be entitled to payments for any loss of crops planted following receipt of the Construction Notice in the locations designated in the Construction Notice. If upon receipt of a Construction Notice, Owner (i) has not planted a crop in the location of improvements designated in the Construction Notice for a growing season in which the improvements will be constructed, but (ii) has applied fertilizer, pesticides, or other similar inputs in the location of such improvements, then Owner will not be entitled to payment for an[y] [sic] loss of crops planted following receipt of the Construction Notice, but Grantee [wind project] will reimburse Owner for the actual cost of the fertilizer, pesticides or other inputs applied in the location of such improvements.
>
> (e) Subject to the provisions of subsection (d) above, Owner and Grantee agree that Grantee shall pay, as liquidated damages for any crop loss and related disruption during Construction Activities, $500.00 per acre on which crops are destroyed or disturbed. Payments for damages to crops shall be paid within thirty (30) days of the determination of the amount of liquidated damages owed.

Id.

128. N.D. CENT. CODE § 17-04-06(1)(f) (2009).

The Texas Easement provides an example of a wind easement crop loss provision drafted without the influence of unfair competitive advantage.[129] The Texas clause limits the wind project's obligation to pay crop loss damages to once per growing season and contains a fair formula to calculate damages, a swift dispute resolution technique, and a payment due date.[130]

Wind easement indemnity provisions are now required to indemnify the landowner for damages caused by the project.[131] Although seeming superfluous, the North Dakota Easement indemnity clause demonstrates why this statutory requirement is needed.[132] The last phrase of the North Dakota Easement's provision describing the developer's obligation to indemnify the landowner contains an exception for damage or injuries "attributable to dangers associated with electrical generating facilities."[133] Given the breadth of this exception, it is difficult to see how any damage to the landowner caused by the wind project would ever give rise to a duty to indemnify.

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129. Section 5.6 of the Texas Easement addresses crop damage:

> For crops destroyed or lost due to the [wind project operations], Grantee [wind project] will compensate Owner [landowner] as calculated below, but in no case will Grantee be required to pay more than a single, total crop loss in any one crop year, and no additional, subsequent payments will be due in later years for portions of the Property occupied by Wind Systems. Damages for destruction or loss of existing crops will be calculated using the following formula: Unit Price x Unit Yield Per Acre x Acres Damaged = Damages. Unit Price will be based on the average of the last previous March 1st and September 1st prices for that crop as listed on the Chicago Board of Trade or other equivalent trading market. Yield will be the average of the previous three (3) years' yield according to Owner's records for the smallest parcel of land that includes the damaged area. If Owner does not have yield records available, the parties will use FSA records or other commonly used yield information available for the area. The parties will try in good faith to agree to the extent of damage and acreage affected. If they cannot agree, they will promptly have the area measured and extent of damage assessed by an impartial party such as a crop insurance adjuster or extension agent. Payment will be made within thirty (30) days after determining the extent of damage.

Nacel Form 10-k, *supra* note 118, at Ex. 10.3 § 5.6.

130. *Id*.

131. N.D. CENT. CODE § 17-04-06(1)(f) (2009).

132. Section 10.1 of the North Dakota Easement addresses the responsibility of the wind project developer to indemnify the landowner:

> Grantee [wind project] shall indemnify, defend, protect and hold Owner [landowner] harmless from and against any Claims for physical damages to property and for physical injuries to any person, to the extent caused by Grantee or its employees', agents' or contractors' negligence or willful misconduct; provided, however, that Grantee's obligations for damages to crops shall be limited by Section 9.3. In no event shall Grantee be liable or responsible for losses of rent, businesses opportunities, profits and the like that may result from Owner's loss of use of the portion of the Premises occupied by the Windpower Facilities pursuant to this Agreement, nor for property damage or personal injuries attributable to dangers associated with electrical generating facilities.

HOUSE BILL AND RESOLUTION HISTORY, *supra* note 41, at 96.

133. *Id.*

The unfairness of the North Dakota Easement becomes especially apparent when comparing the wind project developer's indemnity obligation with the landowner's indemnity obligation. The North Dakota Easement obligates the landowner to indemnify the wind project for any damage the landowner causes, whether or not the landowner is negligent and with no exceptions for lost profits or other consequential damages.[134]

Wind project developers are no longer allowed to flex their competitive advantage in ways similar to the North Dakota Easement indemnity provision,[135] and hopefully the bar in North Dakota will move closer to the Texas Easement. The Texas Easement contains an indemnity clause devoid of any signs that unfair competitive advantage played a role in drafting it.[136] The Texas Easement contains one mutual indemnity clause that conveys the same degree of indemnity obligation and protection to both the wind project and the landowner.[137]

c. Wind Projects Must Comply With Law

Wind easements must "obligate the developer, owner and operator of the wind energy facility to comply with federal, state, and local laws and

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134. The landowner also has a duty to indemnify the developer under section 11.6:

> Owner [landowner] shall indemnify, defend, protect and hold Grantee [wind project] harmless from and against Claims for physical damage to property (including, without limitation, Grantee's roads) and for physical injuries to any person, to the extent caused by the operations or activities of Owner or those acting by, for or under Owner.

HOUSE BILL AND RESOLUTION HISTORY, *supra* note 41, at 97.

135. *See* N.D. CENT. CODE § 17-04-06(1)(f) (2009).

136. The Texas Easement's indemnification clause, section 8.1, reads as follows:

> Each Party (such "Indemnifying Party") will defend, hold harmless, and indemnify the other Party and other Party's agents, contractors, employees, invitees, licensees, Lenders, mortgagees, officers, and permittees (each an "Indemnified Party") against any and all claims, damages, expenses, losses, and other liabilities, including, without limitation, reasonable attorneys' fees, resulting from or arising out of (a) any actions of the Indemnifying Party or the Indemnifying Party's agents, contractors, employees, invitees, licenses, or permittees, on the Property, (b) any negligent act or negligent failure to act on the part of the Indemnifying Party or the Indemnifying Party's agents, contractors, employees, invitees, licensees, or permittees, or (c) any breach of this Agreement by the Indemnifying Party; provided, however, the Indemnifying Party will not be liable to the Indemnified Party for consequential damages (such as, but not limited to lost profits) or exemplary or punitive damages that may be claimed by the Indemnified Party. The foregoing limitation on consequential damages will not apply to the extent of an Indemnifying Party's liability for consequential damages to a third party and for which the Indemnifying Party is liable under this Section. This indemnification will survive the termination of this Agreement, but will not extend beyond the applicable statute(s) of limitations. This indemnification will not apply to claims, damages, expenses, losses, and other liabilities to the extent caused by the negligent or willful act or omission on the part of the Indemnified Party.

Nacel Form 10-k, *supra* note 118, at Ex. 10.3 § 8.1.

137. *Id.*

regulations and may not make the property owner liable in the case of a violation."[138] General commitments to comply with law are standard in wind easements and both the North Dakota Easement and the Texas Easement contain one.[139]

The usefulness of this statutory requirement extends beyond requiring general compliance with law provisions, though; it would also protect a landowner from wind easement provisions specifically allowing a wind project to potentially skirt the law. For example, the North Dakota Easement contains a hazardous materials provision that allows the developer to dispose hazardous materials on the landowner's property, and only requires that the property be remediated if the project is caught and required to remediate.[140] If remediation was otherwise required by law, the landowner will now have a basis to insist that it be done whether or not a governmental authority was aware and had required it. In contrast, the Texas Easement does not allow the wind project to dispose hazardous materials on the landowner's property.[141]

d. Reasons to Withhold Landowner Payments Must Be Clearly Stated

Wind easements must "state clearly any circumstances that will allow the developer, owner, and operator of the wind energy facility to withhold payments from the property owner."[142] This is a safety net that prevents

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138. N.D. CENT. CODE § 17-04-06(1)(g) (2009).

139. Nacel Form 10-k, *supra* note 118, at Ex. 10.3 §6.1; HOUSE BILL AND RESOLUTION HISTORY, *supra* note 41, at 96, § 10.3.

140. The North Dakota Easement's hazardous materials provision, section 10.5, is as follows:

> Grantee's Responsibility for Hazardous Materials. If Grantee [wind project] places, disposes or releases any Hazardous Material in or onto the Premises [landowner's property] and such placement, disposal or release results in the contamination of the Premises, then Grantee shall remediate such Hazardous Materials to the extent ordered to do so by a governmental authority with jurisdiction. Owner acknowledges that Grantee has disclosed to Owner that in connection with the ordinary course of construction, operation and maintenance of the Windpower Facilities, Grantee will use limited quantities of Hazardous Materials, at all times in compliance with environmental Law.

HOUSE BILL AND RESOLUTION HISTORY, *supra* note 41, at 96.

141. Section 6.4 of the Texas Easement, relating to hazardous materials, provides:

> Grantee [wind project] will not dispose of, release, store, or use on the Property [landowner's property] or cause or permit to be disposed of, released, stored, or used on the Property in connection with the Operations any substance defined as hazardous in any federal, state or local law, statute or ordinance, except in such quantities as may be required in normal Operations and only if such use is in compliance with applicable law.

Nacel Form 10-k, *supra* note 118, at Ex. 10.3 § 6.4.

142. N.D. CENT. CODE § 17-04-06(1)(i) (2009).

wind projects from exercising their competitive advantage to use creative drafting to contractually allow them to withhold landowner payments in unexpected ways.

An example of this type of creative drafting is buried in the lengthy North Dakota Easement force majeure definition.[143] The fourth alternative definition of an event of force majeure is "any change in applicable law or regulation or any order from an authority with appropriate jurisdiction that makes it impossible for a Party to perform its obligations hereunder in a commercially reasonable manner . . . ."[144] The force majeure provision[145]—as opposed to the definition—did not limit the type of obligation that force majeure would forgive. And therefore, unlike typical power purchase contracts[146]—the contracts by which the wind project will earn its revenue—the wind project could rely on force majeure to forgive its obligation to pay the landowners. This careful drafting will forgive the project owner for not paying the landowners should changes in laws or regulations increase project expenses over the 40 year term such that the project cannot pay all its other obligations. This conclusion results from the reasonable presumption that it will be commercially unreasonable to pay the landowners (an obligation that can be forgiven by force majeure) if

143. The definition is as follows:

> Force majeure" means any occurrence beyond the reasonable control of a party, which causes that party to be unable to perform, in whole or in part, an obligation under this Agreement, and which was not anticipated as of the Effective Date, and which could not have been avoided by the exercise of due diligence. Force Majeure includes, but is not limited to: (i) acts of God and natural catastrophes; (ii) actual or threatened civil disturbance, terrorism, war, or riot; (iii) strike or other labor dispute (in which case the affected party shall have no obligation to settle the strike or labor dispute on terms it deems unreasonable); (iv) any change in applicable law or regulation or any order from an authority with appropriate jurisdiction that makes it impossible for a Party to perform its obligations hereunder in a commercially reasonable manner; (v) emergencies declared by or forced curtailment required by the ISO or any other authorized successor or regional transmission organization or any state or federal regulator or legislature; and (vi) physical damage to the transmission system making it impossible to transmit energy from the Project.

HOUSE BILL AND RESOLUTION HISTORY, *supra* note 41, at 93.

144. *Id.* at 93.

145. Section 19.3 of the North Dakota Easement lays out the force majeure provision:

> If performance of this Agreement or of any obligation hereunder is prevented or substantially restricted or interfered with by reason of an event of Force Majeure (as defined below) [sic], the affected party, upon giving notice to the other party, shall be excused from such performance to the extent of and for the duration of such prevention, restriction or interference. The affected party shall use its reasonable efforts to avoid or remove such causes of nonperformance and shall continue performance as soon as such causes are removed.

Id. at 99.

146. *See* WSPP Agreement, § 10 (follow "current WSPP Agreement"), http://www.WSPP.org/documents_agreement.php (showing a force majeure clause in a contract for electrical power sales).

doing so would cause a payment default elsewhere. Such clever drafting denying landowners payments in unexpected ways is no longer allowed.[147]

2. *Required Wind Easement Terms that Favor Wind Projects*

a. Tensions Between Competing Business Operations are Resolved in Favor of the Wind Project

When two separate business operations co-exist on the same general acreage—usually a wind project and an agricultural operation—tensions will arise at some point and wind easements have planned ahead to resolve those tensions. Wind easements:

> [m]ust preserve the right of the property owner to continue conducting business operations as currently conducted for the term of the agreement. When a wind energy facility is being constructed and when it is completed, the property owner must make accommodations to the developer, owner, or operator of the facility for the facility's business operations to allow the construction and operation of the wind energy facility.[148]

Only the first sentence of this provision was contained in the version of House Bill 1509 originally passed by the House.[149] The Senate added the second sentence.[150] As a result, except during the development phase, North Dakota law requires that the needs of wind projects trump the needs of North Dakota landowners.

There are alternative approaches better suited to balancing the needs of both operations. The Texas Easement specifically addresses "agricultural activities" and produces fairer results to competing business operation issues.[151] The Texas wind project assumes the burden to take reasonable

147. N.D. CENT. CODE § 17-04-06(1)(i) (2009) (providing that wind easements and leases "must state clearly any circumstances that will allow the developer, owner, and operator of the wind energy facility to withhold payments from the property owner").

148. *Id.* § 17-04-06(1)(d).

149. H.B. 1509, 61st Leg. Assem., § 1(1)(e) (N.D. 2009), *available at* http:/www.legis nd. gov/assembly/61-2009/bill-text/JBSB0200.pdf.

150. H.B. 1509, 61st Leg. Assem., § 1(1)(d) (N.D. 2009), *available at* http:/www.legis nd. gov/assembly/61-2009/bill-text/JBSB0300.pdf.

151. Section 6.5 of the Texas Easement sets forth this provision:

> In connection with Operations [wind project operations] on the Property [landowner's property], Grantee [wind project] will take reasonable efforts not to interfere with Owner's agricultural activities on the Property; provided, however, the Parties acknowledge and agree the Operations will affect Owner's activities on the Property, particular during installation, maintenance, and repair, including preventing Owner's operations on those portions of the Property on which Wind Systems are located.

Nacel Form 10-k, *supra* note 118, at Ex. 10.3 § 6.5.

efforts to not interfere with the agrarian operation but the project clearly has preference during installation, maintenance, and repair—but not operation. As a result, the Texas Easement is actually more pro-landowner than current North Dakota law allows.[152] The 2011 legislature could consider scaling back "construction and operation" in section 17-04-06(1)(d) to "construction, maintenance and repair."

b. Landowner's Ability to Terminate Wind Easements Due to Project Inactivity

Changes in wind project economics could cause the current phase of wind project expansion to change such that one day North Dakota landowners are forced to look at abandoned wind towers without contractual recourse. To ward off that possibility, wind easements:

> [m]ust allow the property owner to terminate the agreement if the wind energy facility has not operated for a period of at least three years unless the property owner receives the normal minimum lease payments that would have occurred if the wind energy facility had been operating during that time.[153]

As initially passed by the House, this provision contained just the first clause and ended with a period after "three years."[154] The Senate added the concept that the contract could not be terminated if the landowner had been receiving full payments.[155] An additional compromise came out of the conference committee when minimum payments became sufficient to prevent termination.[156]

North Dakota's decommissioning regulations currently provide that two years of wind tower inactivity constitutes a presumption that a facility is at the end of its useful life, triggering an eight month period to begin decommissioning and an eighteen month window to complete

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152. N.D. CENT. CODE § 17-04-06(1)(d) (2009).

153. *Id.* § 17-04-06(1)(h). This section continues:

> For the purposes of this subdivision, the term "normal minimum lease payments" means a payment in the lease or easement called a "base amount" or "minimum payment", or similar language, or if this language is not provided for in the lease or easement, payments at least equal to the periodic payments received by the property owner in the last calendar year that the wind energy facility was in full operation.

Id.

154. H.B. 1509, 61st Leg. Assem., § 1(1)(j) (N.D. 2009), *available at* http:/www.legis nd.gov/assembly/61-2009/bill-text/JBSB0200.pdf.

155. H.B. 1509, 61st Leg. Assem., § 1(1)(i) (first engrossment with Senate amendments), *available at* http:/www.legis nd.gov/assembly/61-2009/bill-text/JBSB0300.pdf.

156. H.B. 1509, 61st Leg. Assem., § 1(1)(h) (first engrossment with conference committee amendments), *available at* http:/www.legis nd.gov/assembly/61-2009/bill-text/JBSB0400.pdf.

decommissioning.[157] North Dakota's decommissioning regulations and House Bill 1509 were never perfectly meshed, and the 2011 legislature will have an opportunity to review N.D.C.C. section 17-04-06(1)(d) in light of the then-current version of the decommissioning regulations.

c. Required Wind Project Insurance

Owners of wind projects are required to "carry general liability insurance relating to claims for property damage or bodily injury arising out of the construction or operation of the wind energy facility project site and may include the property owner as an additional insured on the policy."[158] Earlier versions of House Bill 1509 passed by both the House and the Senate had required that landowners be named as additional insureds on the wind project's policy.[159] This requirement was compromised into an option during the conference committee.[160] Because the project's lenders will require the project to carry general liability insurance coverage, section 17-04-06(2) has limited value until project financing is paid off.

It is extremely important that a landowner be named an additional insured on the wind project's general liability policies. Doing so prevents the project's insurer from pursuing a subrogation action against the landowner to recover amounts paid when the landowner's action arguably caused the covered damage to occur.

Comparing the insurance provisions in the North Dakota Easement and the Texas Easement demonstrates the difference between an insurance provision drafted under the influence of excessive competitive advantage and one that was not. Section 10.2 of the North Dakota Easement provides the provision regarding insurance:

> Grantee [wind project] shall maintain commercial general liability insurance insuring Grantee against loss caused by Grantee's use of the Premises, in an amount not less than One Million Dollars ($1,000,000.00) of combined single-limit coverage, and

157. N.D. ADMIN. CODE § 69-09-09-03, -04 (2009), *available at* http://www.legis nd.gov/information/acdata/pdf/69-09-09.pdf.

158. N.D. CENT. CODE § 17-04-06(2) (2009).

159. H.B. 1509, 61st Leg. Assem., § 1(2) (N.D. 2009) (first engrossment), *available at* http:/www.legis nd.gov/assembly/61-2009/bill-text/JBSB0200.pdf; H.B. 1509, 61st Leg. Assem., § 1(2) (N.D. 2009) (first engrossment with Senate amendments), *available at* http:/www.legis nd.gov/assembly/61-2009/bill-text/JBSB0300.pdf.

160. H.B. 1509, 61st Leg. Assem., § 1(2) (N.D. 2009) (first engrossment with conference committee amendments), *available at* http:/www.legis nd.gov/assembly/61-2009/bill-text/JBSB0400.pdf.

> shall provide certificates of this insurance coverage to Owner [landowner] upon written request." [161]

Section 8.2 of the Texas Easement provides its provision regarding insurance:

> Grantee [wind project] will maintain liability insurance covering the Operations on the Property and will cause Owner [landowner] to be named as an additional insured. Such coverage will have a minimum combined occurrence and annual limitation of one million dollars ($1,000,000.00) during the Evaluation Period and two million dollars ($2,000,000.00) during the Operating Period, provided that such amount may be provided as part of a blanket policy covering other properties. Grantee will supply Owner with certificates and other evidence of this insurance as Owner may reasonably request."[162]

The Texas Easement fairly balanced the interests of the landowner and project by requiring that the landowner be named as an additional insured and setting the minimum amount of insurance at two million dollars once the project was constructed. Excessive competitive advantage is evidenced by the North Dakota Easement's failure to require the wind project to make the landowner an additional insured, and by setting the minimum amount of insurance at only one million dollars.

d. The Ability of Wind Projects to Require That Wind Easements Remain Confidential

Wind easements "[m]ay not require either party to maintain the confidentiality of any negotiations or the terms of any proposed lease or easement except that the parties may agree to a mutual confidentiality agreement in the final executed lease or easement."[163]

Even though both the North Dakota House and the Senate passed versions of House Bill 1509 that banned wind easement confidentiality clauses,[164] the conference committee compromise[165] preserved the status

161. HOUSE BILL AND RESOLUTION HISTORY, *supra* note 41, at 96.

162. Nacel Form 10-k, *supra* note 118, at Ex. 10.3 § 8.2.

163. N.D. CENT. CODE § 17-04-06(1)(c) (2009).

164. H.B. 1509, 61st Leg. Assem., § 1(1)(d) (N.D. 2009) (first engrossment) , *available at* http:/www.legis nd.gov/assembly/61-2009/bill-text/JBSB0200.pdf; H.B. 1509, 61st Leg. Assem., § 1(1)(c) (N.D. 2009) (first engrossment with Senate amendments), *available at* http:/www.legis nd.gov/assembly/61-2009/bill-text/JBSB0300.pdf.

165. H.B. 1509, 61st Leg. Assem., § 1(1)(c) (N.D. 2009) (first engrossment with conference committee amendments), *available at* http:/www.legis nd.gov/assembly/61-2009/bill-text/JBSB0400.pdf.

quo: (a) wind easements will continue to have confidentiality provisions because no individual landowner would compromise economic terms to avoid a confidentiality requirement; and (b) signing separate confidentiality agreements may still be required before receiving a proposed wind easement.[166]

Confidentiality requirements are the wind industry's most effective tool to preserve and cultivate their competitive advantage. Publicly traded wind companies like Nacel are filing unredacted copies of their executed wind easements with the SEC[167] making it more difficult for North Dakota wind companies to credibly argue that confidentiality is crucial. The 2009 legislature failed to mitigate this key source of wind project competitive advantage.[168] The 2011 legislature will have an opportunity to revisit the issue.

V. NEXT STEPS

The playing field on which wind projects and landowners negotiate wind easements is not yet level. But the 2009 legislature took the important step of preventing wind projects from exercising their competitive advantage to distribute form wind easements that are patently unfair. As seen above, the mitigating efforts of section 17-04-06 reined in the North Dakota Easement on many fronts.

The debate over how to mitigate wind project competitive advantage will continue during the 2011 legislative session but the interim study on "wind easements and wind energy leases" required by House Bill 1509[169] will provide a better foundation on which to advance the debate. This study "must include consideration of confidentiality clauses, the liability of each party for damages and taxes, instrument provisions relating to insurance and the need for insurance, and the concerns of property owners and wind developers."[170] The study will conclude by "report[ing] its findings and recommendations, together with any legislation required to implement the recommendations to the sixty-second legislative assembly" which convenes in January 2011.[171]

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166. *See supra* text accompanying notes 105-106.

167. Nacel Form 10-k, *supra* note 117, at Ex. 10.3.

168. N.D. CENT. CODE § 17-04-06(1)(c) (2009).

169. H.B. 1509 § 2, 61st Leg. Assem. (N.D. 2009) (enrolled), *available at* http:/www.legis.nd.gov/assembly/61-2009/bill-text/JBSB0500.pdf.

170. H.B. 1509 § 2, 61st Leg. Assem. (N.D. 2009) (enrolled), *available at* http:/www.legis.nd.gov/assembly/61-2009/bill-text/JBSB0500.pdf.

171. H.B. 1509 § 2, 61st Leg. Assem. (N.D. 2009) (enrolled), *available at* http:/www.legis.nd.gov/assembly/61-2009/bill-text/JBSB0500.pdf.

The interim study's required focus on wind easement terms and conditions has the potential to provide the clearest possible picture of the degree to which the wind industry has competitive advantage in North Dakota. A high pressure technique to one person may be mere sport to a hardier soul, but the contract terms will be objective evidence subject to little interpretation. The fact that high pressure sales techniques are not used to pressure people into signing fair contracts indicates that the amount of competitive advantage can be measured by gauging the fairness of the respective contracts.

The 2009 legislature had little opportunity to receive and review actual wind easement terms. First and foremost, confidentiality obligations prevented landowners from either testifying about their contracts or submitting copies. But even if allowed, verbal descriptions of contract terms have little probative value because it is too easy for landowners to confuse the actual written terms with what wind project representatives have told them the contract says. In addition, as was seen in the discussion of the North Dakota Easement, small phrases buried deep in long paragraphs can pack a significant punch.[172]

The Energy Development and Transmission Committee is responsible for conducting the interim study[173] and it is destined to experience the same limitations as the 2009 legislature. Although it will be able to hear testimony on "the concerns of property owners and wind developers,"[174] confidentiality provisions will also prevent it from hearing testimony concerning the other subjects assigned to it—confidentiality clauses, the liability of each party for damages and taxes, and wind easement provisions relating to insurance.[175] A vehicle other then public testimony is required to obtain verifiable information on the interim study's contractual components and this paper concludes by suggesting what that alternative vehicle is.

I propose the Energy Development and Transmission Committee accomplish the contractual review component of the interim study by designating a team of North Dakota lawyers or law students to analyze numerous unsigned form wind easements. Details of this proposal follow.

What contracts need to be reviewed? Unsigned form wind easements that have been distributed to North Dakota landowners, as well as unsigned

172. *See* HOUSE BILL AND RESOLUTION HISTORY, *supra* note 41, at 93, 96, 99.

173. North Dakota Legislative Council, Study Directives Considered and Assignments Made by the Legislative Management for the 2009-2010 Interim, 61st Legis. Assem., at 1-5 (N.D. 2009), *available at* http://www.legis.gov.assembly/61-*2009/docs/pdf/citation.pdf.*

174. H.B. 1509, 61st Leg. Assem., § 2 (N.D. 2009) (enrolled), *available at* http:/www.legis.nd.gov/assembly/61-2009/bill-text/JBSB0500.pdf.

175. *See id*.

form easements used in other states should be studied. Reviewing contracts from other states is crucial because they are necessary to determine whether or not years of unbridled exercise of competitive advantage in North Dakota has already lowered the bar, as was suggested by the above comparison between the North Dakota Easement and the Texas Easement.

Who will provide the contracts? Owners of wind projects located in North Dakota should be willing to provide the Energy Development and Transmission Committee with accurate unsigned copies of their form North Dakota wind easements and a representative selection of unsigned form wind easements that their affiliates use in other states. A procedure to verify the accuracy of the form contracts could be implemented and confidentiality obligations could be imposed. The pool of agreements should also include those publicly available through SEC filings.

Why ask for unsigned form wind easements? Signed contracts are subject to confidentiality obligations and unsigned documents should be within the total control of the wind project owner. In addition, reviewing unsigned form wind easements allows the legislature to better understand what landowners are signing when they fail to retain legal counsel or otherwise negotiate changes, or when wind projects refuse to negotiate.

What if wind projects are unwilling to supply the unsigned form easements? Since the goal of reviewing the form wind easements is to determine the scope of wind project competitive advantage, wind industry stonewalling allows the legislature to conclude that the level of wind project competitive advantage is significantly high for purposes of evaluating appropriate mitigation. Wind projects can choose to rebut that conclusion by delivering copies of their unsigned form wind easements.

Who would do the review? There should be North Dakota attorneys or law students willing to perform the review pro bono in order to gain the experience and knowledge necessary to pursue the representation of landowners on a regular basis. Retaining a third party to conduct the review may also make it easier to keep the form easements out of the public domain.

What will the reviewers be asked to do? The reviewers must be asked to meet the minimal requirements of the interim study; that is, review and compare confidentiality clauses, the liability of each party for damages and taxes, and provisions relating to insurance. Reviewing actual contracts is the only way to get this information. Second, it would be extremely informative to extend their review to contractual elements set forth in

Landowner Guidelines for Evaluating Wind Energy Production Leases.[176] Third, the review could include how close North Dakota wind easements come to meeting North Dakota's standards for fairness. Do they contain any provisions that are "unjust, unfair, inequitable, misleading, or deceptive"?[177]

How would information gleaned from their review be distributed and used? The reviewers would prepare a report for the Energy Development and Transmission Committee that describes their findings in such a way that contract terms cannot be traced to a certain wind project company. Their report will provide a firm foundation on which the Committee can determine the degree to which wind projects have competitive advantage in North Dakota, evaluate mitigation necessary to allow fairness to prevail, and support any proposed legislation during the 2011 legislative session.

VI. CONCLUSION

Both wind energy and agriculture are important industries in North Dakota today and into the distant future. Allowing one to have unbridled competitive advantage over the other is not conducive to maximizing the long term success of either. The goal of North Dakota's wind easement statute is to level the playing field between wind projects and North Dakota landowners so that fair and just wind easements result. That goal was not reached in 2009, but is more likely to be achieved in 2011 if the detailed contractual analysis described above is done first.

176. Harsh et al., *supra* note 78.

177. N.D. CENT. CODE § 26.1-30-21(2) (2002), *available at* http://www.legis nd.gov/cencode/t261c30.pdf.

EC-1394



Wind Turbine Lease Considerations for Landowners

Dwight Aakre, Farm Management Specialist
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NDSU Extension Service

Legal, binding contracts between landowners and wind energy development companies are a necessary part of any wind farm development project. The tendency may be to streamline the development process to move the project ahead faster. Landowners may be told the contracts they are being asked to sign are standard contracts for wind projects and the terms of the contract are fixed and the same for everyone. However, until a contract is signed, any and all of the contract provisions are negotiable.

Once signed, all parties involved have given written approval of the provisions of that contract and are legally bound to fulfill their part. Therefore, if you don't like something about a contract, negotiate a change before signing. The difficult part is knowing to what degree the various components of the contract can be changed. Talking with other people involved in the project is helpful and, ***most importantly, seek competent legal advice before signing.***

Before you sign on the dotted line, these are some questions you should ask:

How much of my land will be tied up and for how long?
How much will I be paid and how will I receive payments?
Are the proposed payments adequate now and will they be adequate in the future?
Have all liability issues been considered?
Have I considered all contract specifications?
Are there any other considerations?

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North Dakota State University
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How much of my land will be tied up and for how long?

Duration of contract

Leases to landowners for wind farm development have two components. One component is a contract to lease the wind development rights for some fixed length of time (wind option agreement). This lease gives the company the right to develop the wind power over the contracted acreage and excludes any other company from developing the wind resource during the length of the lease. This lease should be of limited duration. Typically these leases would run from three to five years, possibly with an option to renew for a specified number of years. These leases typically will provide for an annual payment to the landowner of $2 to $10 per acre for the area covered in the lease. If no development has taken place before the end of the lease period, the landowner then would be free to negotiate a lease with another developer should the opportunity arise. (See N.D.C.C. Chapter 17-04)

The second component is the contract for the actual tower and related development, such as access roads. This lease is longer by necessity to give the wind developer an opportunity to recover the investment cost and earn a market rate of return on the investment. Recovering the cost of investment typically will take 15 to 20 years. Therefore, wind tower leases usually will cover 20 to 25 years, with an option to extend the contract an additional period of time. (See N.D.C.C. Chapter 17-04)

Having both components in the same contract is common, but landowners should be cautious in signing a combined contract. The payment for the right to develop the wind resource may look like quick and easy money, but the majority of the income will come from the right to build the wind tower. Being sure landowners are receiving fair compensation for the wind tower development is important as well.

Renewable period

Contracts covering the lease of the wind development rights and wind turbine construction typically specify an option to extend or renew the contract for a specified number of years. Check to see if the contract specifies the option to renegotiate the terms of the lease at the time of renewal. Since these contracts cover an extended period of time, considerable changes may have occurred in the marketplace during that period of time.

Tower removal responsibilities and specifications

What happens to the wind tower when it becomes obsolete or otherwise uneconomical to operate? If the tower is no longer generating income for the landowner, it becomes a nuisance for normal farming and ranching operations and should be removed. Does the contract specify how soon the tower and other structures, including access roads, will be removed and who is responsible for the cost? The removal cost will be substantial. Is the owner/operator of the facility responsible for removal?

The North Dakota Public Service Commission recently made an administrative ruling dealing with



Construction of the underground base for a wind turbine.
(Photo by Ron Beneda, Cavalier County Extension Agent)

decommissioning of wind turbines. Effective Oct. 1, 2008, the owner or operator of the commercial wind energy conversion facility is responsible for removing the wind turbines and related facilities when no longer useful. They must remove the turbines and facilities within three years of the end of electricity generation unless a new plan is proposed to reuse the turbines. The commission may order a bond or other financial assurances, but only after the 10th year of operation of the facility. (See N.D. Admin. Code Chapter 69-09-09 referenced below.)

Placement of access roads

Each tower requires an access road for maintenance and repair. A roadway across an annually cropped field will result in loss of efficiency of field operations. However, the loss of efficiency can be minimized if the roadway runs the same direction as field operations are conducted. Contracts should allow for landowner input regarding access roads.

Construction period

During construction of a wind tower, considerable land will be impacted in excess of acreage needed for the tower and access road. The contract should include provisions for paying for all crop damage that occurs during the construction phase.

Responsibility for roads, fences and gates

The contract should cover who is responsible for maintenance of access roads. It also should specify who is responsible for snow removal. Piling up snow to clear access can seriously delay spring field work, which usually results in lower yields.

Fences, gates and cattle guards become an issue when a wind tower is on grazing land. The contract should specify who is responsible for construction and maintenance of any necessary fencing, gates and cattle guards. These costs should be the responsibility of the wind energy developer.

How much will I be paid and how will I receive payments?

Payments per tower or megawatt

Payment to the landowner may be per tower, per megawatt produced, a percent of the gross revenue produced or a combination of these methods. *Towers vary in capacity from less than 1 megawatt to at least 3 megawatts.* As the technology improves, turbines with greater output capacity can be expected. Consequently, rates per tower vary considerably.

Anecdotal reports indicate most companies are paying $4,000 to $6,000 annually per megawatt of tower capacity for fixed-compensation packages. For royalty-compensation packages, 3 percent to 5 percent of gross revenue from electricity sales is common, including renewable certificates. Landowners should negotiate for inclusion of renewable, pollution and environmental credits in addition to the sale of electricity.

Types of compensation packages

Fixed payments – preferably includes an escalator (see below). Advantage: Stable income for landowners, low risk.

Royalty or percentage of revenue – Need to have access to relevant information about power sales. Advantage: Landowner has a vested interest in the success of the project.

Combinations – Fixed payment plus a percentage of revenue; greater of fixed payment or a percentage of revenue.

Equity partnership – Income is in relation to the percent ownership of the project.

Transparency of wind company financial records

If landowners are to receive a percent of gross revenue as part or all of the lease payment, they must have some way of verifying the revenue generated by the wind energy project. How will the contract holders have access to the company's financial records to verify the revenues produced by the wind farm?

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Are the proposed payments adequate now and will they be adequate in the future?

Inflation and escalator clauses

Wind tower contracts are usually 20 years or more in length, with an option to extend the contract for another similar length of time. This necessitates including an escalator clause that will adjust the payment for inflation. A common escalator is the Consumer Price Index (CPI), which is used to adjust Social Security payments for inflation. The CPI would be a suitable escalator for wind payments as well. If a landowner signed a 25-year lease that paid $5,000 per tower with no escalator clause and inflation continued as it has the past 25 years, the landowner's $5,000 lease payment would have the purchasing power of only $2,380 at the end of the lease.

Lease payments that are based on a percentage of the gross revenue generated by the wind tower may have some inflation built in; however, negotiating an escalator clause for these payments would benefit the landowner as well.



Pulleys are attached to transmission poles to string lines. *(Photo by Ron Beneda, Cavalier County Extension Agent)*

Property tax

In North Dakota, agricultural real estate is valued based on productivity value, and buildings and improvements are exempt. Wind tower development is considered commercial property and would be taxed according to commercial property rules. Landowners need to be sure the contract specifies that the landowner is not responsible for any property tax assessment due to wind tower development.

Income tax

Income from leases or easements, as well as annual payments for turbines, is considered rental or royalty income and not subject to self-employment tax.

Energy credits

Two types of energy credits are associated with wind energy development. They are production tax credits and tradable renewable energy credits. A federal income tax credit of 2.1 cents per kilowatt-hour is available for wind projects that are producing power before Dec. 31, 2009. This credit is part of the revenue generated by a wind project. The developer will use this credit to reduce corporate income tax obligations. Without this tax credit, many wind projects would not be feasible. Nonetheless, if a landowner's compensation includes a percent of the revenue generated by the project, this tax credit should be included in the revenue calculations.

Renewable energy credits (RECs) represent a right to market characteristics associated with environmentally friendly power generation. RECs are tied to the amount of electrical energy generated from the project. When RECs are traded, the entity purchasing the RECs gains the right to claim environmental benefits. The market value of RECs represents revenue generated by the wind project and should be included in the gross revenue generated by the project. Currently the market value of RECs is minimal but may increase in value in the future.

Have all liability issues been considered?

Landowners need to be concerned about their exposure to liability that may result from the placement of wind turbines and related structures and equipment on their property. Personal and farm liability policies likely will not cover incidents that occur related to construction and operation of a wind energy project. *Examine the contract to determine if the project developer or any other company to which your lease may be assigned will be responsible for any financial obligations you may incur because of noise, visual pollution, vandalism and construction activities. Have your insurance agent review the agreement.*

Noise - Wind turbines cause a steady, low-decibel sound that can be heard within a short distance.

Visual pollution - Visual pollution refers to the unwanted obstruction or intrusion into someone's view of the landscape.

Vandalism - Wind towers or related equipment may be damaged by vandals on landowner property.

Access roads - Access roads are a necessary component of a wind development project. Making sure the natural flow of water is not impeded by road construction is important.

Construction period - Construction activity could include damage to overhead and underground power lines and communication cables, tile lines, natural drains, road surfaces and neighboring property.

Ice shedding - Ice falling from tower or blades may be a hazard to humans or animals and may cause damage to structures or vehicles below.

Blade drop/throw - Blades may become damaged because of structural failure or imbalance. Blades or parts of blades may fall and cause damage below.

Shadow flicker - The shadow effect of moving turbine blades may cause health issues.

Fire - A fire or electrical short could occur in the generator, transformer or lines. Fire could cause damage to cropland, grassing land or dwellings.

Stray voltage - Stray voltage may be a concern for humans and animals.

Electromagnetic fields - Electromagnetic fields may cause interference with electrical devices. These fields may have long-term health effects to humans or animals.

Lightening strikes - High towers are of concern because they may attract lightning. Lightning strikes could affect humans, farm animals, wildlife and man-made structures. They also could create a risk of crop or prairie fires.

Communications - Turbines may generate electromagnetic noise or physically obstruct signals.

Microwave and radar stations - Towers may obstruct point-to-point signals of telecommunications and weather transmissions.

TV and radio signals - Interference may occur with TV and radio signals.

Police/fire/ambulance radio signals - Public safety signals could be disrupted.

Bird kill - Bird and bat casualties are a reality of wind tower development. The Endangered Species Act, Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act may be factors in tower placement.

Water - Water pollution is a consideration during the construction phase.

Air - Air pollution may occur during construction excavation by producing air-borne elements. This situation is usually temporary.



(Photo by Ron Beneda, Cavalier County Extension Agent)

Have I considered all contract specifications?

Confidentiality clauses in the contract - Some contracts include a confidentiality clause to prevent parties being offered a contract from discussing the terms of the contract with other parties being offered a contract. This leaves the landowners at a disadvantage relative to the wind energy company in negotiating terms.

How will contract disputes be handled?

Is the contract clear on what land use will be limited around the turbines?

Negligence - Does the turbine owner have sufficient liability insurance to cover possible claims?

Have nuisance issues been addressed? A nuisance arises when the wind turbine substantially and unreasonably interferes with the rights of a person or the general public.

Have safety and maintenance issues been addressed? Large physical structures and electricity pose inherent dangers. Damage to landowner property during and after construction is a possibility.

Have personal injury issues been addressed during and after construction? Contractors or third parties, along with the general public, have the potential to be injured.

Will contract specifications limit agricultural land use?

Will contract specifications limit hunting and recreational use?

Will aerial crop spraying be impacted in the area and should this be a consideration in the agricultural impact to the land?

Are there any other considerations?

U.S. Department of Agriculture's Farm Service Agency mortgage restrictions

Any land with a FSA mortgage needs an extensive approval process. The approval process is extensive enough that the wind developer may not want to deal with it.

U.S. Department of Agriculture programs

Approval may be needed from the U.S. Department of Agriculture if the land or landowner is involved in any of these federal programs:

- Wetlands
- Conservation Reserve Program (CRP)
- Commodity program payments
- Swampbuster provisions
- Conservation Security Program (CSP)
- Environmental Quality Incentives Program (EQUIP)
- Wildlife Habitat Incentives Program (WHIP)
- Farmland Protection Program (FPP)
- Grassland Reserve Program (GRP)
- Wetlands Reserve Program (WRP)

North Dakota State Government

These agencies cannot provide legal advice regarding private wind turbine leases but can provide information about other aspects of wind energy:

Public Service Commission (PSC)

The PSC is responsible for siting wind farms above 100 megawatts. The commission coordinates recommendations and requirements from local, state and federal organizations when siting wind farms. These include environmental, cultural and social issues connected with the project. (N.D.C.C. Chapter 49-22).

The Office of the Attorney General

The Office of the Secretary of State

This office keeps records of all companies that meet requirements to do business in the state of North Dakota.

The Department of Commerce

This agency works with local officials to encourage wind development in the state.

The Tax Department

This office can provide information on tax incentives that are available to renewable energy projects in the state.

Applicable North Dakota law and rules

North Dakota Century Code Chapter 17-04:
Wind energy property rights

The sections of law in this chapter discuss wind option agreements, provide a definition of wind easement and provide that a lease for wind energy is void and terminates if development to produce energy from wind power has not occurred on the leasehold within five years after the lease commences.

North Dakota Century Code Section 47-05-17 (effective through July 31, 2009): Severance of the right of access for hunting prohibited

This section only relates to wind turbine easements signed after Aug. 1, 2007, and is in effect only until July 31, 2009. It protects the right to hunt on land covered by a wind turbine easement.

North Dakota Century Code Section 49-02-27: Power of the commission to establish rules to decommission wind energy conversion facilities

This section of law states what may be addressed in rules to decommission wind energy conversion facilities.

North Dakota Administrative Code Chapter 69-09-09

These rules define a commercial wind energy conversion facility and put responsibility for decommissioning on the owner or operator of a commercial wind energy conversion facility. They also cover the useful life of a facility, decommissioning period, decommissioning requirements, decommissioning plan, financial assurance and what happens if the owner or operator fails to decommission the commercial wind energy conversion facility.

Sources

Wind Energy Siting Handbook, Tetra Tech EC Inc. and Nixon Peabody LLP, February 2008

Neil Hamilton, director of the Agricultural Law Center, Drake University

Lynn Hamilton, Michigan State University and Cal Poly

Agricultural Marketing Resource Center, Iowa State University

Elizabeth Williams, DTN

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Useful Web sites

www.calt.iastate.edu/
web1.msue.msu.edu/
www.flaginc.org/
www.windfarmersnetwork.org/
www.agmrc.org/renewable_energy/wind_energy/
www.law.cornell.edu/
www.eere.energy.gov/windandhydro/windpoweringamerica/
www.energy.iastate.edu/
www.windaction.org/
www.windustry.org/

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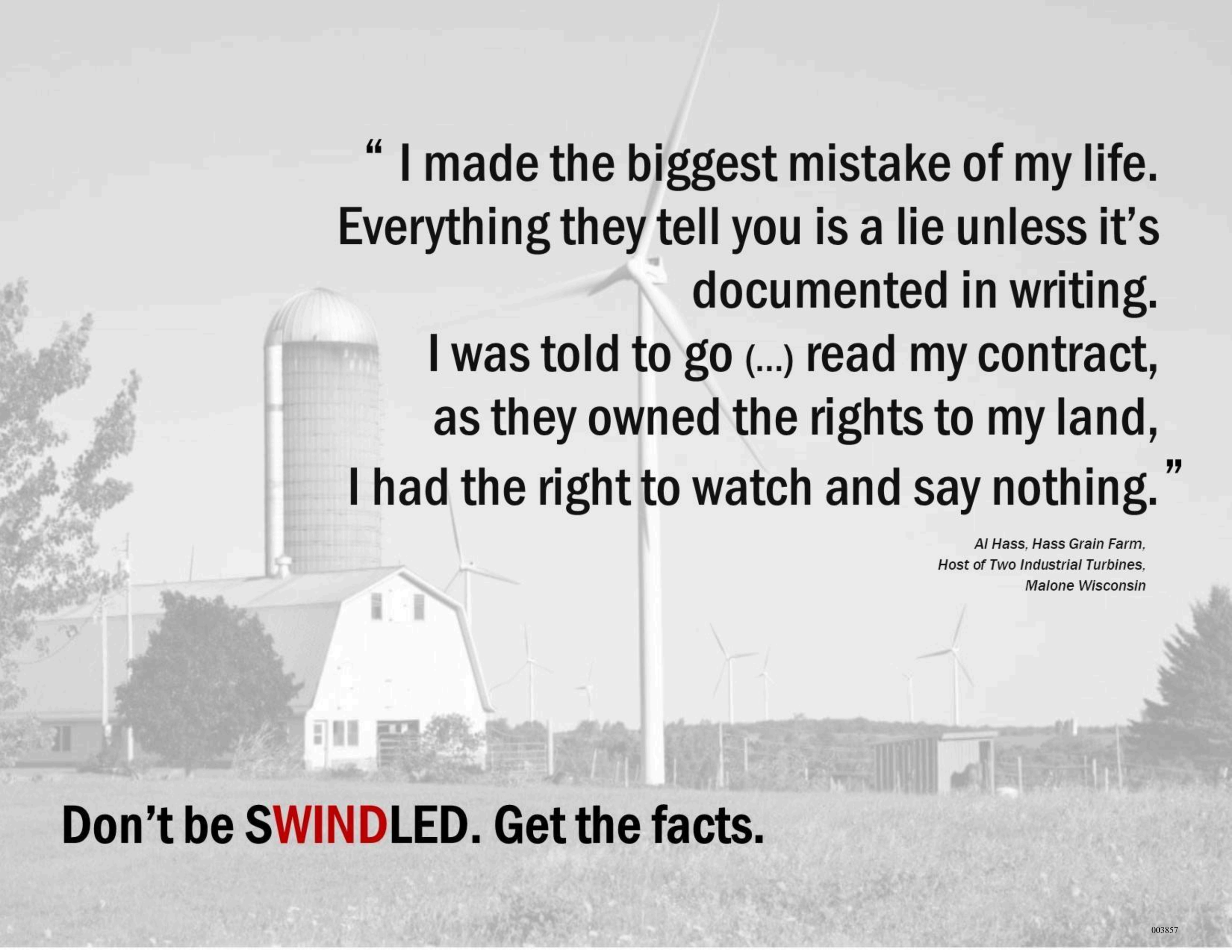
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“ I made the biggest mistake of my life. Everything they tell you is a lie unless it’s documented in writing. I was told to go (...) read my contract, as they owned the rights to my land, I had the right to watch and say nothing. ”

Al Hass, Hass Grain Farm,
Host of Two Industrial Turbines,
Malone Wisconsin

Don’t be SWINDLED. Get the facts.

Revised July 2008

LANDOWNER GUIDELINES FOR EVALUATING WIND ENERGY PRODUCTION CONTRACTS

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The process of evaluating a wind energy development contract can be complex, and the signing of such a contract involves a long-term commitment by the landowner. Contracts can be as short as a few pages or as long as a hundred pages. As a general rule, longer documents provide more detailed responsibilities for the contracting parties and are more likely to provide specific answers for disputes that arise in the future. It is also important to note that nearly all contracts are option contracts and do not guarantee that wind energy will be developed on the property. A modest fee ($5 to 10 per acre) is paid for the option of developing the property for wind energy generation. Whether this option is exercised will depend upon a number of factors (e.g., adequacy of the wind resource, electricity prices, proximity to the electrical grid, local regulations, etc.)

Wind energy development contracts are typically provided in two forms – as leases or as easements. In legal terms, a lease "gives a right of ...occupation, whereas...easements...involve rights of use."[1] In the case of wind energy contracts, the contract deals with the occupation or use of land and airspace. Regardless of the type of contract used, the issues involved in a lease or an easement are similar – the duration of the contract (ranging from a period of years to a permanent transfer of rights), the landowner's compensation payments, the liability of each party, the transfer of the contract to third parties, and many other issues – must be resolved between the parties negotiating the contract.

This worksheet is designed to help landowners consider some important issues that should be considered when negotiating a contract and some of the alternatives that might be considered to address those issues. This worksheet is divided into sections related to key issues in wind energy contracts. Where appropriate there are comments to help you understand some alternatives to consider for each issue. It is strongly advised that you obtain legal assistance to better understand the provisions presented in the contract. ***This worksheet is not a substitute for obtaining legal counsel regarding the contract – it is intended to help focus your discussions with qualified legal counsel.***

I. Basic Details of the Contract

Name of agent/company offering the contract_____

Description of land parcel(s) and portions of parcel(s) included in the contract _____

Contact person/company _____

II. Introductory Issues

A. What are your long-term (25 to 35 years) plans for the land parcel(s) covered by the contract?

- ❑ Retain in farming
- ❑ Commercial development
- ❑ Recreational use (e.g., hunting)
- ❑ Keep as "natural" as possible

1 Roger A. Cunningham, William B. Stoebuck, and Dale A. Whitman. *The Law of Property* 2nd Rev. Ed. St. Paul, MN: West Publishing, 1993.

❑ Sell to others ❑ Other _____

Wind energy contracts are long-term contracts, with the shortest in length being 20 to 25 years and the longest as much as 99 years. If you or your heirs have plans to use these parcels for another purpose during the life of the contract, you may be prevented from doing so by the contract or because the parcel is less desirable for the purpose you envision in the future.

B. To what degree will the contract payments help or hinder your plans or goals?

❑ Very important for plans or goals
❑ Somewhat important for plans or goals
❑ Limited importance for plans or goals
❑ Somewhat hinders plans or goals
❑ Significantly hinders plans or goals
❑ Neither helps nor hinders plans or goals

The contract payment might help achieve your plans or goals and will likely affect your financial options in the future. If the contract payments help achieve your financial objectives, then the contract might be useful in meeting your future goals. On the other hand, if the contract prevents your use of the property for other purposes, then the contract may hinder your longer term goals or plans.

C. Who is offering the contract?

❑ A leasing agent
❑ A Michigan wind energy developer/utility
❑ An international wind energy developer/utility
❑ A community wind project
❑ An out-of-state wind energy developer/utility
❑ Other_____

There are many firms offering wind energy contracts. Some firms assemble contracts for a block of land that could be developed into a wind farm and then sell the contracts to a wind developer for a fee. Another firm may offer contracts and intend to develop the wind project itself. Issues to consider are: Does the firm have prior experience in developing wind projects and, if not, is there a good chance it will succeed with the project? Would you prefer to have a contract with a community-based project, an in-state firm, or a firm located out of state or in a foreign country? Regardless of who originally offers the contract, there may be an assignment clause in the contract. Be sure to see section IV below for details about assignment clauses. If you are dealing with a firm from outside Michigan, see section IX below for issues related to out-of-state firms.

D. Does the contract have a confidentiality clause?

❑ Yes ❑ No

Some legal analysts advise against signing a contract containing a confidentiality clause. This clause may prevent discussion of the contract with other landowners involved in the project and may inhibit family communications. In any case, the contract should specify exactly what is required by the confidentiality clause.

III. Duration of the Contract

Wind energy contracts can last for a wide range of durations. A contract can be permanent easement or an agreement "in perpetuity" (both meaning that the landowner is transferring a permanent right to the developer), or a contract can have a series of time periods. The usual time periods might be: 1) an evaluation phase, 2) a production phase, and 3) an option for extension of the production phase. <u>The sum of these phases can be quite long, and landowners should be aware of the duration of each phase and the total duration of the contract</u>.

A. Evaluation or discovery phase

1. What is the time permitted for the evaluation phase? _____ Years
2. If the developer is permitted to extend the evaluation phase, how long is the extension? _____Years

In the evaluation phase, the developer will collect information about wind quality and conduct an economic analysis to determine the viability of the project. In some cases, the contract will permit the evaluation phase to

be extended by the developer. It is usually desirable for the landowner to keep this phase as short as possible. With a long evaluation phase, a developer can control the property for several years while waiting for the project's viability to improve (e.g., easier access to the electricity grid, finding financial resources, higher electricity prices). During this time, you would not be permitted to sign a contract with another developer who has more immediate plans to develop the property. Note: This issue is of such critical importance that some states (e.g., South Dakota) have limited the phase to 5 or 7 years by law. Michigan has no such law and the parties must resolve this issue in the contract.

B. Production phase.
What is the length of the production phase? _____ Years

The length of the production phase in the contract is usually 20 to 30 years. A long production phase is necessary because the investment has a long payback period. Usually, a shorter phase is desired because this provides an earlier opportunity for the landowner to renegotiate the terms of the contract or use the land for other purposes.

C. Renewal or extension of the production phase
What is the length of time the production phase may be extended by the developer?_____ Years

Some developers claim that an extension clause is necessary to obtain financing for the project. Most wind projects, however, have financing terms of 12 to 15 years, well within the range of the initial production phase. Consider the following issues if faced with this decision: What land use decisions might you, your heirs, or a buyer want to make? Will the contract payments be sufficient 30 years from now? It is generally in the landowner's best interest to be able to renegotiate the terms of the contract before it is renewed, or to be able to terminate the contract at the end of the production period. By avoiding an automatic extension clause, you might be able to protect your future land use options. If the developer seeks an extension clause, then additional financial compensation should be negotiated.

D. Total contract period
To determine the maximum time the parcel will be committed to the contract, use the following:

Is the contract (either as a lease or as an easement) "permanent" or "in perpetuity," or does the contract permit the developer to extend the contract for an indefinite period at the developer's discretion?
❑ Yes ❑ No
If yes, then the contract is either a permanent transfer of the use right ("permanent" or "in perpetuity"), or it provides the developer an open-ended right of use. If no, then the duration of the contract should be calculated as:

Evaluation Phase (A.1) _____ + Evaluation Phase Extension (A.2) _____ + Production Phase (B) _____ + Production Phase Extension (C) = _____ Total Years Committed

IV. Compensation Clauses

Because there are many payment options, the determination of the compensation clause is a difficult issue in any contract for wind energy development. Careful attention must be paid to the payment method's impact on the landowner's returns for the entire length of the contract.

A. What is the payment being offered during the evaluation phase of the contract? _____ $/Acre

This payment is offered for the option of developing the parcel for production of electricity from wind. Be aware that a firm offering a higher payment does not imply that the firm is more committed to actually developing the

property for wind energy. Thus, do not become too concerned with this payment – instead, focus on the payments during the production phase for the contract. Production payments are much more critical in determining the landowner's long-run returns from the project.

B. What method is used to determine payments for the electricity generated during the production phase of the contract?

- ❑ A lump-sum payment at the beginning of the contract ($_____)
- ❑ An annual fixed payment per turbine ($_____)
- ❑ A payment based on a percentage of the electricity sales (____%)
- ❑ A payment based on an annual fixed payment and a percentage of the electricity sales ($ _____ annually and _____%)
- ❑ Other_____

If the contract offers a lump-sum payment at the beginning of the contract, then this payment will be the only payment you will receive during the life of the contract. There might be situations in which having access to an immediate payment is desirable, but care should be taken with this option. What are the tax consequences of a lump-sum payment? How does it compare to a contract with payments over time? To compare the options, use a standard financial annuity formula to convert the lump-sum payment into annual payments. It is important to make this calculation so you are fully informed about your decision.

The option of a fixed payment per turbine guarantees the landowner's payment regardless of how much electricity is generated. Thus, the developer will bear the risk related to variations in the electricity generated. At the same time, you will receive this payment only if the project is actually developed. With this option, it is important to know the size of the turbine because the payment offered should be higher for larger turbines.

Another option is for the contract to share a percentage of the electricity sales with the landowner. Thus, returns can vary based on variations in wind speed and the landowner will share in the risk associated with the quantity of electricity produced. To obtain an estimate of the payment received under this contract, obtain the following information about the Power Purchase Agreement (PPA) that the developer has negotiated with the electricity buyer (the electricity generated is usually measured at the connection to the grid or at the turbine site):

- *The electricity sale rate (Dollars per kilowatt-hour);*
- *An estimate of the annual kilowatt-hours of electricity generated per turbine at the point where the power is measured (this will be affected by the quality of the wind resource and the size and type of turbine installed);*
- *Your percentage share of the electricity sales specified by the contract.*

By multiplying these three estimates, you can calculate your estimated annual returns per turbine. With this payment option, there could be many unknowns because the PPA, the wind resource strength, and the type of turbine to be installed might not be known at the time of the signing of the contract.

C. How many turbines will be installed on your property? _____

For contracts offering a fixed payment per turbine or a percentage of electricity sales, it is necessary to estimate the number of turbines to be installed on your property. This payment will vary by the size of turbine installed. With larger turbines, the payment per turbine should probably be larger. The number of turbines multiplied by the expected annual payment per turbine will equal the total annual payment.

D. Will "pooling" be used to calculate the value of electricity sales?

❑ Yes ❑ No

This procedure might be used if the contract payment is based on a percentage of the electricity sales. If pooling is used, then your returns will be based on your share of the acreage in the project. If you own 10% of

the total acreage in the project, then your share would be 10% of the electricity sales from all the turbines in the project, even if you had more or less than 10% of the turbines on your property.

E. Does the compensation clause include the sale of the Renewable Energy Credits (RECs)?
❑ Yes ❑ No

Electricity from renewable energy projects (including wind) has two sources of value: 1) the value of the electricity generated (Dollars per kilowatt hour) and 2) the value of the Renewable Energy Credits (RECs). When negotiating the PPA, the developer might sell both the electricity and the RECs, or the developer might sell only the electricity, with the RECs being sold to another buyer. In either case, does the contract share the value of the RECs with the landowner? How will the value of the RECs be determined? Landowners should be aware that some analysts expect the value of the RECs to increase in the future as the states or the federal government enact Renewable Portfolio Standards or new regulations on climate change issues.

F. Does the compensation clause have an inflation adjustment provision?
❑ Yes ❑ No

Because of inflation, a dollar ten years from now will have less value than a dollar today. It is desirable, therefore, to have a compensation contract that increases your payment to adjust for inflation at specific intervals (e.g., annually or every five years). The developer is likely to have an inflation adjustment included in the PPA with the utility. Therefore, the landowner should request an inflation adjustment clause to protect the value of future payments. Otherwise, the inflation-adjusted value of your payment will diminish significantly over the 20 to 30 year life of the contract.

G. Does the compensation clause include payment for the land removed from existing uses by the developer (such as permanent roadways or structures) during the production phase?
❑ Yes ❑ No

During the production phase, the developer must have access to the turbines and may need to construct other structures on the land. The contract should specify the landowner's payment per acre for the use of this land.

H. Does the compensation clause include payment for the land used by the developer during the construction phase, such as temporary roadways, temporary structures, space for large equipment such as cranes, etc.?
❑ Yes ❑ No

During the construction phase, the developer might need access to land on a temporary basis. If such use interferes existing with uses of the land (e.g., prevents the planting of a crop or destroys an existing crop), the contract should specify the landowner's payment per acre for the use of this land during this phase. In addition, the contract should specify that land used on a temporary basis will be returned to its original state by the developer before the construction is concluded.

I. Does the contract contain a Force Majure clause?
❑ Yes ❑ No

A Force Majure clause permits the developer to extend the time of the contract if a delay is caused by any law, legal action, or requirement of a government agency, court, or utility. The clause might also apply to natural causes that prevent the development or use of the project. During the time this clause is in effect, any payment due to you could be delayed or avoided by the developer. These clauses are common in oil and gas contracts.

IV. Assignment Clauses

A. Does the contract have an assignment clause?

❑ Yes ❑ No

An assignment clause permits the wind developer to sell/transfer the contract rights to another party. Thus, a contract with this clause might mean that a different company will own the rights to the contract in the future. If the contract has an assignment clause, you may want to consider at least two options. First, you may want to negotiate a higher payment rate as compensation for the risk you face in dealing with another party in the future. Second, you may want to negotiate a provision in which the developer is liable if the contract is assigned to a third party and the third party fails to satisfy the terms of the contract (especially the payment terms). In a similar matter, does the contract permit the developer to mortgage the contract rights to a third party without the landowner's permission? If the developer mortgages the property under contract to a third party, and the developer then defaults to the third party, the landowner's rights relative to the developer and the third party might be affected. A contract should specify the conditions under which a mortgage may be exercised by the developer and the landowner's right of approval in such a case. In additional, the contract should limit the landowner's obligations to the third party.

VI. Property Taxes

A. Does the contract specify who will pay the property taxes associated with turbine(s), other equipment, or any other improvements on the property?

❑ Developer ❑ Landowner

The turbine(s) and any other associated improvements are likely to be considered improvements in the property and therefore subject to property tax. In some cases, contracts specify that the developer is liable for the property taxes associated with the wind project. If the landowner is to be liable for such tax increases, the compensation received by the landowner should reflect such an expense.

VII. Liability Issues

A. Who will be responsible for liability coverage?

❑ Developer ❑ Landowner

Several liability issues should be considered in the negotiation of a contract. First, is the landowner liable for damage he/she commits to the turbine and other facilities on the property? Second, is the landowner liable for damages caused by a third party whom the landowner grants permission to use the property? For example, assume the landowner gives permission for a third party to hunt on the land. If the hunter damages a turbine, is the landowner liable for those damages? Third, is the developer liable for damages to the landowner's property at each phase (evaluation, construction, production) of the contract? Fourth, is the developer liable for damages that occur to a third party? For example, assume a third party is injured by ice that falls from the blades of a wind turbine. Is the developer or the landowner liable for the third party's injuries? Fifth, is the developer liable for the injury of a worker that occurs on the landowner's property? Finally, does the contract require the developer to carry insurance on the turbine and associated facilities? In addition to consultation with an attorney, the landowner should have the contract reviewed by his/her insurance agent.

B. Who will pay the cost of any litigation with a third party?

❑ Developer ❑ Landowner

Litigation with a third party can arise in many situations. For example, assume a neighbor, claiming to be affected by the noise or flicker of the turbine, sues to halt the operation of the turbine. Will the cost of responding to that lawsuit be borne by the developer or the landowner?

VIII. Other Restrictions on Land Use

A. Does the contract contain other restrictions (e.g., a prohibition of hunting) that prevent the landowner from using the property for other desirable purposes?

❑ Yes ❑ No

The contract may contain provisions that limit the landowner's use of the land. At the very least, the contract is likely to limit the height or location of building construction near the turbine(s), the height of trees or other obstructions near the turbine(s), and other activities that could interfere with the operation of the turbine(s). While some provisions are necessary to permit the efficient operation of the turbine(s), landowners should be sure that such clauses are narrowly written to prevent interference with other activities on the property.

B. Who will pay the cost (e.g., fines, etc.) for violations of land use regulations caused by the project?

❑ Developer ❑ Landowner

Wind projects can be subject to many local land use and zoning regulations (e.g., setback regulations). If the project violates a regulation, and a fine or other penalty must be paid, which party will be liable for such a violation? The contract should specify (a) each party's responsibility in complying with such regulations during the life of the contract and (b) each party's responsibility in the case of violations of such regulations.

C. Is the turbine or an associated structure located on land enrolled in the Conservation Reserve Program (CRP) or Farmland and Open Space Preservation Program (PA-116)?

❑ Yes ❑ No

Wind turbines may be placed on land enrolled in the CRP, but such projects must be approved by USDA as "consistent with the conservation of soil, water quality, and wildlife habitat." Landowners should consult with the Farm Service Agency and/or the Natural Resources Conservation Service regarding the placement of turbines or other structures on CRP acreage. The contract should also specify which party is liable for any penalties or fines imposed for violations of CRP regulations. Also, if the land is enrolled in the PA-116 program, be sure to contract does not void participation in this program.

D. Is the turbine or an associated structure located on land enrolled in USDA commodity programs?

❑ Yes ❑ No

If a turbine or facility is located on land enrolled in USDA commodity programs, how will the developer's use of that land affect the landowner's farm program payments? Does the contract payment received by the landowner justify the loss of commodity program payments? Landowners should consult with the Farm Service Agency to determine the impact of the developer's use of the land on commodity program payments.

IX. Choice of Law/Choice of Venue Clauses

A. Does the contract contain a choice of law clause or choice of venue clause?

❑ Yes ❑ No

If you are considering a contract with a developer from outside Michigan, you should examine the contract for both a choice of law clause and a choice of venue clause. A choice of law clause might specify that any litigation that arises under the contract must apply the laws of the state in which the developer is located. While the dispute might be heard in a Michigan court, the court would be required to apply the laws of the developer's home state. If the contract contains a choice of venue clause, the case would be heard by a court in the developer's home state. It is usually in the landowner's best interest to have all legal disputes resolved under Michigan law by a Michigan court.

X. Termination of the Contract

A. Does the contract specify the events that permit the developer to terminate the contract?

❑ Yes ❑ No

A particularly important issue is whether the developer is permitted to terminate the contract "at any time without cause." If so, what are the landowner's rights to any remaining payments under the contract?

B. Does the contract specify the landowner's rights of termination?

❑ Yes ❑ No

Particular attention should be paid to how the landowner must exercise the right of termination (including the issue of whether arbitration – including binding arbitration – is required).

C. Is the process defined for the removal of the turbine and associated facilities (i.e., structures, roads) at the conclusion of the contract?

❑ Yes ❑ No

You should be aware that some local zoning codes specify the conditions that must be met at the time of termination. Contact local zoning officials to determine if such regulations apply to your property.

D. Who must pay the costs of removing the turbine and facilities at the conclusion of the contract?

❑ Developer ❑ Landowner

The cost of installing and removing a wind turbine can be substantial. The contract should specify which party will pay the costs of removing the turbine and associated facilities when the contract is terminated. Some contracts require the developer to pay these costs and to retain funds in escrow that will be sufficient to pay these costs. The contract should also specify the condition of the land after the removal/clean up process.

XI. Other Issues

There are many more issues that should be considered in negotiating a wind energy contract. Only the assistance of competent legal counsel can address the full list of issues that should be considered. The following is a partial list of other issues that should be considered.

A. Does the contract grant broad access and use of the land parcel to the developer? In general, such provisions should be narrowly written to limit the use of the land to those portions necessary for the conduct

of the project.

B. Is the landowner an LLC or other form of business organization other than a sole proprietorship? Michigan contract law might treat contracts between an LLC and a developer in a different manner than discussed here.

C. Does the contract require the developer to include the landowner on the developer's insurance policy?

D. Does the contract address the issue of default during the project? What are the landowner's rights if the developer defaults, leaving an unfinished project?

E. Does the contract require that disputes be submitted to mediation or arbitration before a lawsuit can be filed? If so, what is the mediation/arbitration process? Is the arbitration process binding on the parties?

F. Does the contract include any other form of mineral rights or property rights? If the contract includes any other form of property rights, be sure that the contract includes compensation for the purchase of other rights.

G. Does the contract specify which party is liable for enforcing trespass laws and the actions of trespassers?

H. Does the contract or a local zoning regulation require bonding by either party during the project?

I. If a change in a law invalidates one portion of the contract, does the remainder of the contract apply as written?

XII. Conclusion

The development of electricity generated from wind has the potential to be a viable industry in Michigan. To participate in this industry, landowners should be aware of the economic benefits and the potential legal risks associated with negotiating a contract for the generation of electricity from wind. Above all, landowners should be aware that signing a wind contract should be a matter of negotiation. The landowner should be aware of the terms of the contract and should seek greater compensation for terms of the contract that are less favorable to the landowner. The contract provisions listed above, along with many other aspects of the contract, should be considered carefully given the long term of commitment required by many contracts. Negotiation of an equitable contract requires the assistance of effective legal counsel. If satisfactory terms or compensation are not provided in the contract, new or additional terms should be negotiated or the contract should not be signed.

XII. Other Resources

Noling, Bernard. *Guidelines for Landowners in Negotiating Wind Energy Leases.* Southwest Kansas Royalty Owners Association, 2003. (Retired attorney reviews the problems that landowners can experience with a poorly negotiated lease. A must-read for any landowner). Available at http://www.swkroa.com/formspublications.html

McEowen, Roger A. *Wind Energy Production: Legal Issues and Related Concerns for Landowners.* Center for Agricultural Law and Taxation, Iowa State University. Available at http://www.calt.iastate.edu/windenergy.htm

Windustry. *Leasing Your Land to a Developer.* Available at http://www.windustry.com/leases

Windustry. *Leases and Easements.* (Includes "webinar" presentations from Iowa State University and Colorado State University). Available at http://www.windustry.com/taxonomy/term/120

Stoel Rives, LLP, Attorneys at Law. *The Law of Wind: A Guide to Business and Legal Issues.*2006. (If your attorney is unfamiliar with wind energy contracts, be sure to direct him/her to this website.) Available at http://www.stoel.com/webfiles/LawOfWind_WEB_02_07.pdf (Also at http://www.windustry.com above.)

"A two-megawatt windmill contains **260 tonnes of steel** requiring **170 tonnes of coking coal and 300 tonnes of iron ore**, all mined, transported and produced by **hydrocarbons**."



"a windmill could spin until it falls apart and **never generate as much energy** as was invested in building it." ...-Thomas Homer-Dixon. Carbon Shift


003868
IRONY: An oil leak from
a clean, green wind turbine



003869

CODINGTON COUNTY
NOTICE OF PUBLIC HEARING BY THE BOARD OF ADJUSTMENT
ON A CONDITIONAL USE PERMIT

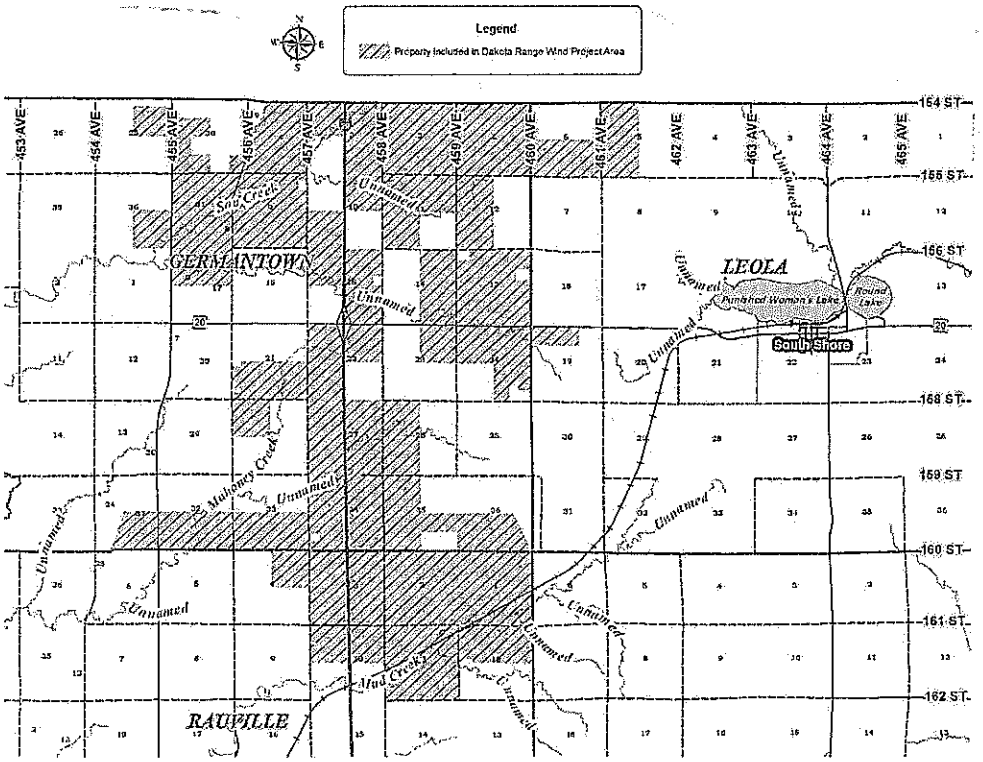
Notice is hereby given that a Public hearing will be held by the Codington County Board of Adjustment on Monday, June 19, 2017 at 7:30 pm in the Codington County Extension Complex to consider in full or in part the following proposed Conditional Use Permit Application:

- A Conditional Use Permit Pursuant to Section 3.04.02.21 Wind Energy System. The applicants, Dakota Range I, LLC and Dakota Range II, LLC, are requesting to operate a Wind Energy System with up to 48 wind turbines and associated electrical transmission lines on certain property situated in Germantown, Leola, and Rauville Townships as displayed in the below map and available for review at the Codington County Zoning Office.

All persons interested therein may appear and be heard before the Board of Adjustment at said hearing. Written comments may be filed with the Zoning Officer at 1910 West Kemp Avenue on or before Friday, June 16, 2017.

Luke Muller Zoning Officer

Dakota Range I, LLC and Dakota Range II, LLC:
Wind Energy System Orientation Map



Published once at approximate cost of $

C2017-014

Findings of Fact
Conditional Use Permit
Dakota Range I, LLC and Dakota Range II, LLC: Wind Energy Systems
June 19, 2017

This matter having come before the Board of Adjustment and the Board having taken testimony and heard the evidence, the Board enters the following Findings of Fact in support of its motion to approve the Petitioner's application for a Conditional Use Permit.

1. Standard Findings of Fact for Conditional Uses and Variances adopted March 17, 2014.
2. The following use is listed in the A – Agricultural Zone and Zone C and Zone B of the Aquifer Protection Overlay District of the Codington County Zoning Ordinance and (Ref: SDCL 11-2-17.3):

   Wind Energy Systems (Ref: Zon. Ord. 3.04.02.21).

   All uses permitted by conditional use in the underlying district which do not pose a potential risk to groundwater resources and are not a prohibited use may be approved by the Board of Adjustment provided they can meet Performance Standards outlined for the Aquifer Protection Overlay Zones. (Ref: Zon. Ord. 3.12.04.02.6)

   All Conditional Uses allowed in underlying districts, with the exception of those prohibited, may be approved by the Board of Adjustment provided they can meet Performance Standards outlined for the Aquifer Protection Overlay Zones. (Ref: Zon. Ord. 3.12.05.02.1)

3. On or before June 5, 2017, Dakota Range I, LLC and Dakota Range II, LLC. applied for a conditional use permit to operate a Wind Energy System on his property in Germantown, Leola, and Rauville Townships As displayed in Exhibit "A" attached and hereby incorporated by reference

4. This application meets the definition of a Wind Energy System.

5. This permit should not become effective until all required permits are granted by the state and federal government, including the remaining applications and licenses referenced in the application.

6. The application and testimony at this meeting allowed the Board to adequately review how the applicant will satisfy requirements for site clearance, topsoil protection, compaction, livestock protection, fences, public roads, haul roads, turbine access roads, private roads, control of dust, soil erosion and sediment control, electromagnetic interference, lighting, turbine spacing, footprint minimization, collector lines, feeder lines, decommissioning, tower height and appearance, and noise.

7. The applicant satisfactorily demonstrated the ability to meet required setbacks for turbines from property lines, right-of-way, residences, businesses, government facilities and other structures, uses and features which would require setback.

8. The applicant submitted Boundaries of the site proposed for WES on a USGS Map, a map of easements, maps of occupied residential structures, businesses, churches, and buildings owned and/or maintained by a governmental entity, maps of sites for WES, access roads, and utility lines, location of other WES in general area, project schedule, and mitigation measures.

9. The agreement in the letter of assurance that the applicant will obtain a haul road agreement satisfies the requirement for a haul road agreement.

10. No other issues were brought up with the application or during testimony which relate to the Zoning Ordinance or Land Use Plan that needed to be addressed.

11. That Wind Energy Systems such as proposed by the applicant are allowable in the A – Agricultural District, Zone B, and Zone C of the Aquifer Protection District under certain conditions. Therefore The Board of Adjustment finds that it is empowered to grant the conditional use, and that the granting of the conditional use will not adversely affect the public interest.

12. The Board requests the zoning officer to prepare the findings of fact which are to be approved by the Chairman of the Board; and for the zoning officer to issue the conditional use permit and any letters of assurance, building permits or other items associated with said conditional use permit.

13. In order to comply with the requirements of the Zoning Ordinance the Board of Adjustment prescribes the following conditions and safeguards in conformity with the Codington County Comprehensive Land Use Plan and Zoning Ordinance to be agreed to in the form of a "Letter of Assurance":

    1) <u>Effective Date and Transferability:</u>

        a. Upon issuance of applicant permit by South Dakota Public Utilities Commission.
        b. This permit shall expire if no construction described within the application has occurred within three (3) years of issuance of a permit by South Dakota Public Utilities Commission; or if application for permit has not been made on or before June 19, 2020.
        c. The applicant may apply for an extension of this permit if the requirements of 1.b above cannot be met.
        d. The Conditional Use permit for is transferable. Subsequent owners/operators shall agree to the same conditions described herein.

    2) <u>General Requirements:</u>

        a. There shall be no discharge of industrial processed water on the site

b. Storage of petroleum products in quantities exceeding one hundred (100) gallons at one (1) locality in one (1) tank or series of tanks must be in elevated tanks; such tanks larger than eleven hundred (1,100) gallons must have a secondary containment system where it is deemed necessary by the Board of Adjustment.
c. Grantor shall provide the zoning office with an updated local contact information of plant supervisor with authority to implement dust control and other necessary enforcement of the conditions of this permit.

3) Obligation to Meet Requirements:

a. Applicant agrees to meet requirements of Section 5.22 of the Codington County Ordinance in reference to remaining obligations including but not limited to: submittal of Haul Road Agreements, Submittal of Decommissioning Plan, Final site location of towers, building permit application, meeting applicable federal and state requirements, and consideration of bond for abandonment/decommissioning after 10 years.

4) Violation and Penalties:

a. Violations of requirements of the ordinance relating to the operations of a specific tower will result in enforcement/penalties in reference to the specific tower found to be in violation, and will be enforced in the manner as described in Section 4.b below.
b. Violation of the terms of this conditional use permit will be determined by the Codington County Zoning Officer.
   (1) The first violation substantiated by the Zoning Officer of this conditional use permit may result in a notification letter stating the violation and a prescribed period of time to remove the violation. A second violation occurring within one calendar year of the previous violation may result in a review of the validity of the conditional use permit and potential revocation of said permit. A third violation within one calendar year of the initial violation may result in revocation of the conditional use permit and cessation of all feeder operations within forty-five days (45) of notice of revocation.
   (2) The applicant may make appeal from the decision of the Zoning Officer or other agent of the Codington County Board of Adjustment to the Codington County Board of Adjustment. The applicant shall file with the Zoning Officer a notice of appeal specifying the grounds thereof. The Zoning Officer shall forthwith transmit to the Board of Adjustment all papers constituting the record upon which the action appealed from was taken. Such appeal shall be taken within thirty (30) days. Appeals from the Board of Adjustment shall be taken to Circuit Court.
   (3) Failure to comply with the decision of the Zoning Officer or other agent of the Codington County Board of Adjustment may be deemed a separate violation.

The Conditional Use Permit was approved by a vote of 7 yes and 0 no. (Ref: SDCL 11-2-59).

Robert Fox, Chairperson
Codington County Board of Adjustment

Date Approved: June 19, 2017

Date Signed: 7-10-17

Date Filed: 7-10-17

Conditional Use Permit Number(s): CU017-014

Dakota Range

Codington and Grant Counties, South Dakota

Application for Conditional Use Permits
Dakota Range Wind Power Project
Codington County

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4. List of Participating Landowners
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7. Easement Map
8. Site Plan Map Book
9. Area Overview of Other Wind Power Projects Map
10. Project Schedule
11. Example Decommissioning Report
12. Example Noise Impact Analysis
13. Example Shadow Flicker Analysis

c/o Apex Clean Energy, Inc.
310 4th Street NE, Suite 200 | Charlottesville, VA 22902
T 434.220.7595 | F 434.220.3712
apexcleanenergy.com

CODINGTON COUNTY
CONDITIONAL USE PERMIT APPLICATION

APPLICANT (PRINT): Dakota Range I, LLC **PHONE:** 612-834-2680

ADDRESS: 310 4th St. Suite 200, Charlottesville, VA 22902

OWNER (PRINT): See Tab 4 **PHONE:** _____
IF DIFFERENT THAN APPLICANT

ADDRESS: _____

I/WE, THE UNDERSIGNED, DO HEREBY PETITION THE BOARD OF ADJUSTMENT OF CODINGTON COUNTY, SOUTH DAKOTA, TO ISSUE A CONDITIONAL USE PERMIT FOR THE PROPERTY DESCRIBED AS:

LEGAL DESCRIPTION (PLEASE PRINT OR TYPE)

See Tab 5

GENERAL AREA OR STREET ADDRESS: See Tab 6

EXISTING LAND USE: AG **EXISTING ZONING:** AG

SIZE OF PARCEL: ACRES _____ LOT DIMENSIONS: WIDTH _____ LENGTH _____ DEPTH _____

SURROUNDING LAND USE

NORTH: _____
SOUTH: _____
EAST: _____
WEST: _____

PLEASE DESCRIBE WHAT YOU PROPOSE TO DO AND WHY YOU ARE SEEKING A CONDITIONAL USE PERMIT
(ATTACH A SEPARATE SHEET OF PAPER IF NECESSARY)

The Dakota Range Wind Project is a proposed 150 turbine 300 MW Wind Energy System (WES), with up to 48 turbines to be located in Codington County, with the remainder located in Grant County to the north. The purpose of this WES will be to produce power to be sold on the electric grid. See Tabs 2 and 3 for further description of the proposed facility following the requirements in Chapter 5.22 of the Codington County Zoning Ordinance.

SIGNATURE OF APPLICANT _____

SIGNATURE OF OWNER (IF DIFFERENT THAN APPLICANT) _____

NOTE: A SKETCH OF PROPOSED PROPERTY SHALL ACCOMPANY THIS APPLICATION, SHOWING THE FOLLOWING:

1. NORTH DIRECTION
2. DIMENSIONS OF PROPOSED STRUCTURE
3. STREET NAMES
4. OTHER INFORMATION AS MAY BE REQUESTED
5. LOCATION OF PROPOSED STRUCTURE ON LOT
6. DIMENSIONS OF FRONT AND SIDE SETBACKS
7. LOCATION OF ADJACENT EXISTING BUILDINGS

PLEASE USE THE ATTACHED SKETCH INSTRUCTION SHEET FOR AN EXAMPLE

FOR OFFICIAL USE ONLY

DATE FILED WITH ZONING OFFICE: _____
FEE PAID (NON-REFUNDABLE): _____
DATE OF HEARING: _____
ACTION BY BOARD OF ADJUSTMENT: _____ YES _____ NO
EFFECTIVE DATE: _____

COND. USE # _____
BUILDING PERMIT # _____

CODINGTON COUNTY
CONDITIONAL USE PERMIT APPLICATION

APPLICANT (PRINT): Dakota Range II, LLC **PHONE:** 612-834-2680

ADDRESS: 310 4th St. Suite 200, Charlottesville, VA 22902

OWNER (PRINT): See Tab 4 **PHONE:** _____
IF DIFFERENT THAN APPLICANT

ADDRESS: _____

I/WE, THE UNDERSIGNED, DO HEREBY PETITION THE BOARD OF ADJUSTMENT OF CODINGTON COUNTY, SOUTH DAKOTA, TO ISSUE A CONDITIONAL USE PERMIT FOR THE PROPERTY DESCRIBED AS:

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SIZE OF PARCEL: ACRES _____ LOT DIMENSIONS: WIDTH _____ LENGTH _____ DEPTH _____

SURROUNDING LAND USE

NORTH: _____
SOUTH: _____
EAST: _____
WEST: _____

PLEASE DESCRIBE WHAT YOU PROPOSE TO DO AND WHY YOU ARE SEEKING A CONDITIONAL USE PERMIT
(ATTACH A SEPARATE SHEET OF PAPER IF NECESSARY)

The Dakota Range Wind Project is a proposed 150 turbine 300 MW Wind Energy System (WES), with up to 48 turbines to be located in Codington County, with the remainder located in Grant County to the north. The purpose of this WES will be to produce power to be sold on the electric grid. See Tabs 2 and 3 for further description of the proposed facility following the requirements in Chapter 5.22 of the Codington County Zoning Ordinance.

SIGNATURE OF APPLICANT _____

SIGNATURE OF OWNER (IF DIFFERENT THAN APPLICANT) _____

NOTE: A SKETCH OF PROPOSED PROPERTY SHALL ACCOMPANY THIS APPLICATION, SHOWING THE FOLLOWING:

1. NORTH DIRECTION
2. DIMENSIONS OF PROPOSED STRUCTURE
3. STREET NAMES
4. OTHER INFORMATION AS MAY BE REQUESTED
5. LOCATION OF PROPOSED STRUCTURE ON LOT
6. DIMENSIONS OF FRONT AND SIDE SETBACKS
7. LOCATION OF ADJACENT EXISTING BUILDINGS

PLEASE USE THE ATTACHED SKETCH INSTRUCTION SHEET FOR AN EXAMPLE

FOR OFFICIAL USE ONLY

DATE FILED WITH ZONING OFFICE: _____
FEE PAID (NON-REFUNDABLE): _____
DATE OF HEARING: _____
ACTION BY BOARD OF ADJUSTMENT: _____ YES _____ NO
EFFECTIVE DATE: _____

COND. USE # _____
BUILDING PERMIT # _____

Dakota Range

Codington and Grant Counties, South Dakota

DAKOTA RANGE WIND POWER PROJECT

APPLICATION REQUIREMENTS

Dakota Range I, LLC and Dakota Range II, LLC (together "Dakota Range") are requesting Conditional Use Permits to construct a Wind Energy System ("WES") on property located in Codington County (the "Facility"). A WES is a conditional use in the Agricultural Land zoning district, and the entirety of the Facility boundary is located in the Agricultural Land zoning district. The applicable provisions of the Codington County Zoning Ordinance and information addressing those provisions are provided below.

Chapter 5.22: Wind Energy System Requirements

Section 5.22.01: Applicability

Dakota Range plans to construct a WES consisting of up to 48 turbines in Codington County, and a maximum of 150 turbines for the whole Facility spanning Grant and Codington Counties. The power generated will be consumed off-site via the electric transmission grid. Therefore, Chapter 5.22 of the Zoning Ordinance applies to this Facility.

Section 5.22.02: Federal and State Requirements

Dakota Range will meet or exceed standards and regulations of the Federal Aviation Administration ("FAA") and South Dakota State Statutes and any other agency of federal or state government with the authority to regulate WESs.

Section 5.22.03: General Provisions

1. Mitigation Measures

(a) Site Clearance

Dakota Range will disturb or clear the site only to the extent necessary to assure suitable access for construction, safe operation, and maintenance of the WES. Each wind turbine site, including the access road to the turbine, only takes approximately 1-1.5 acres out of production.

c/o Apex Clean Energy, Inc.
310 4th Street NE, Suite 200 | Charlottesville, VA 22902
T 434.220.7595 | F 434.220.3712
apexcleanenergy.com

(b) Topsoil Protection

Dakota Range and its contractors will implement measures to protect and segregate topsoil from subsoil in cultivated lands unless otherwise negotiated with the affected landowner. Such measures typically include removing and separately stockpiling topsoil prior to trenching or excavation, and replacing topsoil after subsoil has been backfilled into the trench.

(c) Compaction

Dakota Range and its contractors will implement measures to minimize compaction of all lands during all phases of the Facility's life and will confine compaction to as small an area as practicable. Mitigation measures typically include using specific crane paths, utilizing mats in areas of compaction concern, and ripping areas compacted by machinery.

(d) Livestock Protection

Dakota Range and its contractors will take precautions to protect livestock during all phases of the Facility's life. These precautions typically involve coordinating with the landowner/tenant to ensure that livestock is either moved to an area not currently under construction, or installing gates/cattle guards to prevent livestock from getting out. The contractors that will be utilized to construct the project are very familiar with and have direct experience working with livestock while constructing wind facilities.

(e) Fences

Dakota Range and its contractors will promptly replace or repair all fences and gates removed or damaged during all phases of the Facility's life unless otherwise negotiated with the affected landowner.

(f) Roads

(f)(i) Public Roads

Prior to commencement of construction, Dakota Range will identify all state, county, or township "haul roads" that will be used for the Facility and will notify the corresponding governing body having jurisdiction over the roads to determine if the haul roads identified are acceptable. The governmental body will be given adequate time to inspect the haul roads prior to use. Where practical, existing roadways will be used for all activities associated with the Facility. Where practical, all-weather roads will be used to deliver cement, turbines, towers, assembled nacelles and all other heavy components to and from the turbine sites.

(f)(ii) Haul Roads

Prior to the use of approved haul roads, Dakota Range will make satisfactory arrangements with the appropriate state, county or township governmental body having jurisdiction over approved haul roads for construction of the Facility for the maintenance and repair of the haul roads that will be subject to extra wear and tear due to transportation of equipment and Facility components. Dakota Range will notify the County of such agreements if requested.

(f)(iii) Turbine Access Roads

Dakota Range will minimize the construction of turbine access roads. Access roads will be low profile roads so that farming equipment can cross them and will be covered with Class 5 gravel or similar material. If access roads need to be constructed across streams and drainageways, the access roads will be designed in a manner so runoff from the upper portions of the watershed can readily flow to the lower portion of the watershed.

(f)(iv) Private Roads

Dakota Range and its contractors will promptly repair private roads or lanes damaged when moving equipment or when obtaining access to the site, unless otherwise negotiated with the affected landowner.

(f)(v) Control of Dust

Dakota Range and its contractors will utilize all reasonable measures and practices of construction to control dust.

(g) Soil Erosion and Sediment Control Plan

Prior to construction, Dakota Range will develop a Soil Erosion and Sediment Control Plan and submit the plan to the County. This plan will address the erosion control measures for each project phase, and will at a minimum identify plans for grading, construction and drainage of roads and turbine pads; necessary soil information; detailed design features to maintain downstream water quality; a comprehensive revegetation plan to maintain and ensure adequate erosion control and slope stability and to restore the site after temporary project activities; and measures to minimize the area of surface disturbance. Dakota Range will also employ other practices including containing excavated material, protecting exposed soil, stabilizing restored material and removal of silt fences or barriers when the area is stabilized. The plan will identify methods for disposal or storage of excavated material.

2. Setbacks

Dakota Range requests that setbacks between parcels that are obtained by either the Dakota Range I, LLC or Dakota Range II, LLC project are waived as the parcels are participants in the Dakota Range project as a whole.

(a) Distance from existing off-site residences, businesses, churches, and buildings owned and/or maintained by a governmental entity

In accordance with the Ordinance, the setback from existing off-site residences, businesses, churches, and buildings owned and/or maintained by a governmental entity will be at least one thousand (1,000) feet. Setback distance from on-site or lessor's residence will be at least five hundred (500) feet. This setback is shown in the map book behind **Tab 8**.

(b) Distance from centerline of public roads

The setback distance from the centerline of public roads will be at least 110% the maximum height of the wind turbines, measured from the ground surface to the tip of the blade when in a fully vertical position. This setback is shown in the map book behind **Tab 8**.

(c) Distance from any property line

The setback distance from any property line will be at least 110% the maximum height of the wind turbines, measured from the ground surface to the tip of the blade when in a fully vertical position, unless a wind easement has been obtained from the adjoining property owner. This setback is shown in the map book behind **Tab 8**.

3. Electromagnetic Interference

Dakota Range will not operate the WES so as to cause microwave, television, radio, or navigation interference contrary to Federal Communications Commission ("FCC") regulations or other law. In the event such interference is caused by the WES or its operation, Dakota Range will take the measures necessary to correct the problem. Dakota Range is working with Interstate Telecommunications Cooperative regarding avoiding and/or mitigating any potential impacts to their facilities.

4. Lighting

The proposed wind turbines will be marked as required by the FAA. There will be no lights on the Facility other than what is required by the FAA. This restriction will not apply to infrared heating devices used to protect the monitoring equipment.

5. Turbine Spacing

The proposed wind turbines will be spaced no closer than three (3) rotor diameters within a string. If required during final micro-siting of the turbines to account for topographic conditions, no more than ten (10) percent of the towers will be sited closer than the three rotor diameters apart. Dakota Range will minimize the need to site turbines closer.

6. Footprint Minimization

Dakota Range will design and construct the Facility so as to minimize the amount of land that is impacted by the Facility. Associated facilities in the vicinity of turbines such as electrical/electronic boxes, transformers and monitoring systems will be mounted on the foundations used for turbine towers or inside the towers unless otherwise negotiated with the affected landowner.

7. Collector Lines

When located on private property, Dakota Range will place electrical lines, known as collectors, and communication cables underground between the WES and the feeder lines. Dakota Range may install collector lines overhead when the total distance of the collectors from the substation requires overhead installation due to line loss of current from an underground installation. Dakota Range also requests the ability to install collector lines overhead when constructability makes it unreasonable to install underground (i.e., river crossing, etc.). Collectors and cables will be placed within or immediately adjacent to the land necessary for turbine access roads, unless otherwise negotiated with the affected landowner.

8. Feeder Lines

Dakota Range will place overhead electric lines, known as feeders, on private lands or in public rights-of-way if a public right-of-way exists. Changes in routes may be made as long as the feeders that are planned on public rights-of-way have obtained approval from the governmental unit responsible for the affected right-of-way. If no public right-of-way exists, Dakota Range will place feeders on private property. However, Dakota Range requests the ability to place feeder lines on private property regardless of the existence of a public right-of-way if an easement has been negotiated with the affected landowner. When placing feeders on private property, Dakota Range will place the feeder in accordance with the easement negotiated with the affected landowner. Dakota Range will submit the site plan and engineering drawings for the feeder lines before commencing construction.

9. Decommissioning/Restoration/Abandonment

(a) Decommissioning Plan

Within 120 days of completion of construction, Dakota Range will submit to the County a decommissioning plan describing the manner in which Dakota Range anticipates decommissioning the Facility in accordance with the requirements of Section 5.22.03.9(b). The plan will include a description of the manner in which Dakota Range will ensure it has the financial capability to carry out these restoration requirements when they go into effect. Dakota Range will ensure that it carries out its obligation to provide for the resources necessary to fulfill these requirements. The County may at any time request Dakota Range file a report with the County describing how Dakota Range is fulfilling this obligation.

An example decommissioning cost estimate, including cost of decommissioning and the salvage value of materials, is included in **Tab 11**.

(b) Site Restoration

Upon expiration of the permit or upon earlier termination of operation of the Facility, Dakota Range will dismantle and remove from the site all towers, turbine generators, transformers, overhead collector and feeder lines, foundations, buildings and ancillary equipment to a depth of four (4) feet. To the extent possible, Dakota Range will restore and reclaim the site to its pre-project topography and topsoil quality. All access roads will be removed unless written approval is given by the affected landowner requesting that one or more roads, or portions thereof, be retained. Any agreement for removal to a lesser depth or for no removal will be recorded with the County and will show the locations of all such foundations. All such agreements between Dakota Range and the affected landowner will be submitted to the County prior to completion of restoration activities. The site will be restored in accordance with these requirements within eighteen (18) months after expiration.

(c) Abandoned Turbines

Dakota Range will advise the County of any turbines that are abandoned prior to termination of operation of the Facility. The County may require Dakota Range to decommission any abandoned turbine.

10. Height from Ground Surface

The minimum height of blade tips, measured from ground surface when a blade is in fully vertical position, will be greater than twenty-five (25) feet.

11. Towers

(a) Color and Finish

The finish of the exterior surface of all turbines installed as part of this Facility will be white, non-reflective, and non-glass.

(b) Design

All towers installed as part of this Facility will be singular tubular design.

12. Noise

The noise level from the Dakota Range facility will not exceed 50 dBA (average A-weighted sound pressure including constructive interference effects) at the property line of existing off-site residences, businesses, and buildings owned and/or maintained by a governmental entity. An example acoustic analysis for the Facility using a Vestas 2.0 MW turbine with a 95m hub height is included in **Tab 12**. A final acoustic analysis confirming compliance with this Ordinance requirement will be submitted prior to applying for building permits.

13. Permit Expiration

Dakota Range requests that the Conditional Use Permits become void if no substantial construction has been completed within three (3) years of the South Dakota Public Utilities Commission Facility Siting Permit issuance. This permit is expected to be acquired in the first quarter of 2018.

14. Required Information for Permit

(a) Boundaries of the site proposed for WES and associated facilities on United States Geological Survey Map or other map as appropriate

See **Tab 6** for the boundary map.

(b) Map of easements for WES

See **Tab 7** for the easement map.

(c) Map of occupied residential structures, businesses, churches, and buildings owned and/or maintained by a governmental entity

See the site plan map book at **Tab 8** for these locations along with their associated setbacks.

(d) Map of sites for WES, access roads and utility lines

See the site plan map book at **Tab 8** for the Facility design. All locations of turbines, access roads, and utility lines are approximate. Final locations depend on turbine model, federal and state permitting, and local micro-siting. All final turbine locations will adhere to applicable County and State requirements. Final locations will be filed with the County in connection with obtaining a building permit.

(e) Location of other WES in general area

See **Tab 9** for general area wind farm map.

(f) Project schedule

See **Tab 10** for the anticipated project schedule.

(g) Mitigation measures

See above for planned Facility mitigation measures as required in Section 5.22.03.1(a-g) of the Ordinance.

(h) Haul road agreements

Final haul road agreements will be submitted sixty (60) days prior to construction. Dakota Range requests that final haul road agreements be permitted to state that collector and feeder lines will not be trenched across public roads or public road right-of-ways unless otherwise agreed to by the road authority.

Chapter 4.05.01: Criteria for Approving Conditional Use Permits

(5) The Board of Adjustment shall make a finding that it is empowered under the section of this Ordinance described in the application to grant the conditional use, and that the granting of the conditional use will not adversely affect the public interest.

Chapter 5.22 of the Codington County Zoning Ordinance applies to all WES facilities except private facilities with a single tower height of less than seventy-five feet and used primarily for on-site consumption of power. The proposed Facility consists of up to 48 wind turbines in Codington County up to 599 feet in height used for off-site consumption. Therefore, Chapter 5.22 of the Zoning Ordinance applies to this Facility. Furthermore, the Facility is located in an Agricultural Land zoning district, in which a WES is a Conditional Use. As evidenced in **Tab 3** and in the below discussion of Chapter 4.05.01.06, the Facility will not adversely affect the public interest.

(6) Before granting any conditional use, the Board of Adjustment must make written findings certifying compliance with the specific rules governing individual conditional uses and that satisfactory provision and arrangements have been made concerning the following, where applicable:

(A) Entrance and exit to property and proposed structures thereon with particular reference to automotive and pedestrian safety and convenience, traffic flow and control, and access in case of fire or catastrophe.

Dakota Range will coordinate with both Codington County and the South Dakota Department of Transportation to ensure all necessary permits are received regarding highway access approach, utility crossings, and ROW occupancy. This coordination and the associated permits are discussed in **Tab 3**.

(B) Off-street parking and loading areas where required, with particular attention to the items in (A) above and the economic, noise, glare or other effects of the conditional use on adjoining properties and properties generally in the district.

Dakota Range has provided an example acoustic analysis for the Facility in **Tab 12**. This analysis shows that the Facility will not exceed the maximum 50 dBA at the property line of existing off-site residences, businesses, and buildings owned and/or maintained by a governmental entity, as required in Section 5.22.12 of this Ordinance. When final layout locations are filed with the County, a final acoustic analysis of the Facility will be provided to show compliance with the Ordinance requirements.

Dakota Range has provided an example shadow flicker analysis for the Facility in **Tab 13**. This analysis shows that the Facility will not exceed a maximum of 40 hours of shadow flicker per year at any existing non-participating residence, business, or building owned and/or maintained by a governmental entity, unless otherwise agreed to by the landowner.

Dakota Range has included a discussion of the economic benefits from the Facility in **Tab 3** of this application.

Dakota Range will utilize prudent industry standards during construction on the site to minimize any impact from parking and loading on the general community. All parking and loading/unloading will occur within the Facility site and will not affect adjoining properties.

(C) Utilities refuse and service areas, with reference to locations, availability, and compatibility.

Dakota Range will meet all State and Local requirements for any refuse from the construction and operation of the Project. The main location for refuse and

service will be at the Project's laydown area, where construction parts, etc., will be delivered for the site. Refuse created during the operational phase of the project will be collected and serviced at the operations and maintenance facility.

(D) Screening and buffering with reference to type, dimensions, and character.

Dakota Range will meet all required County setback buffers from residences, buildings, public roads, and property lines, as described in Section 5.22.2 of the Zoning Ordinance. A map of these setbacks showing compliance with this requirement can be seen in **Tab 8**.

(E) Signs, if any, and proposed exterior lighting with reference to glare, traffic safety, economic effect and compatibility and harmony with properties in the district.

Dakota Range will meet all necessary lighting requirements listed in Section 5.22.4 of this Ordinance. Dakota Range will have temporary signage during construction near turbine locations to identify turbines for both construction and emergency personnel, but does not plan to have any permanent signage. The operations and maintenance facility will have lighting and signage that complies with County requirements.

(F) Required yards and other open space.

This section is not applicable to the use proposed by Dakota Range.

(G) General compatibility with adjacent properties and other property in the district.

The proposed Facility is located in the Agricultural Land (A) district, and the adjacent properties and other properties in this district are used primarily for agriculture or pasture land. As outlined throughout the application, the Facility will comply with all State and County requirements for a WES, which will minimize any potential impact on adjacent properties and other property in the district. Further, the Facility will have a small overall footprint, and agricultural use will be able to continue on properties within and around the Facility site.

Numerous peer reviewed studies appear to conclusively indicate that similar projects have posed no adverse impact to surrounding property values. A study conducted by the University of Connecticut and the Lawrence Berkeley National Laboratory entitled "Relationship between Wind Turbines and Residential Property Values in Massachusetts" found "no effects due to the arrival of turbines in the sample's communities" on property values and also "no unique impact on the rate of home sales near wind turbines." A study prepared by the Ernest Orlando Lawrence Berkeley National Laboratory entitled "A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States" found "no statistical evidence that home values near turbines were affected in the post-construction or post-

announcement/pre-construction periods." Combined, these studies account for 172,000 home sales, and these studies are just a subset of the numerous peer reviewed studies that support similar findings that wind energy facilities have no adverse impact on surrounding property and home values.

Dakota Range

Codington and Grant Counties, South Dakota

DAKOTA RANGE WIND POWER FACILITY

FACILITY DESCRIPTION

A. THE APPLICANT

(i) The Applicants' full names, business address, and business telephone number are:

Dakota Range I, LLC and Dakota Range II, LLC
c/o Apex Clean Energy Holdings, LLC
310 4th Street NE, Suite 200
Charlottesville, VA 22902
(434) 220-7595

(ii) Dakota Range I, LLC and Dakota Range II, LLC (together "Dakota Range") are Delaware limited liability companies and wholly owned indirect subsidiaries of Apex Clean Energy Holdings, LLC ("Apex"). Dakota Range I, LLC and Dakota Range II, LLC are each proposing to separately own approximately 150 MW Wind Energy Systems ("WESs"), constructed on a similar timeline, with certain jointly owned shared interconnection facilities, known together as the Facility. Apex is an independent renewable energy company based in Charlottesville, Virginia. Since its founding in 2009, Apex has become one of the fastest-growing companies in the industry. Apex has one of the nation's largest, most diversified portfolios of renewable energy resources, capable of producing more than 12,000 megawatts ("MW") of clean electricity. Apex was the U.S. market leader in 2015 and has brought 1,460 MW online over the past two years. Operating assets under management have grown to 1,700 MW as of the first quarter of 2017.

Apex offers comprehensive in-house capabilities, including site origination, financing, construction, and long-term asset management services, and works with companies such as AEP, Southern Power, IKEA, the U.S. Army, Steelcase, and others. Apex has the experience, skills, personnel, and proven capability to successfully manage the development, financing, construction, and operation of the Facility.

Dakota Range

Dakota Range has obtained Certificates of Authority from the South Dakota Secretary of State to conduct business in South Dakota. As limited liability companies, sole-member managed by Apex Clean Energy Holdings, LLC, Dakota Range does not have officers and directors.

Correspondence, documents, and filings regarding this application should be sent as follows:

Mark Mauersberger
Senior Development Manager
Apex Clean Energy Holdings, LLC
8665 Hudson Blvd N, STE 110
Lake Elmo, Minnesota 55402
mark.mauersberger@apexcleanenergy.com

with copies to:

Attn: Legal Department
Apex Clean Energy, Inc.
301 4th Street NE, Suite 200
Charlottesville, VA 22902
legal@apexcleanenergy.com

B. THE FACILITY

The Facility will be situated on approximately 40,000 acres, in Codington and Grant Counties, and will consist of up to 150 modern turbines, with up to 48 located in Codington County. The total installed capacity of the Facility will not exceed 300 MW. The portion of the Facility situated in Codington County will consist of:

- Up to 48 wind turbine generators;
- Access roads to each turbine;
- Underground 34.5 kilovolt ("kV") electrical collector lines connecting the turbines to the collector substation;
- Underground fiber-optic cable for turbine communications co-located with the collector lines;
- An operations and maintenance ("O&M") facility; and
- Up to 3 permanent meteorological ("met") towers.

Turbines

Each wind turbine consists of three major components: the tower, the nacelle, and the rotor. These components are mounted on a concrete foundation, also known as a turbine pad, to provide structural support to the assembled turbine. The height of the tower, or "hub height" (height from the base of the tower to the center of the rotor hub on top of the tower), will be dependent on the final turbine selection and design. The nacelle sits atop the tower, and the rotor hub is mounted on a drive shaft that is connected to the gearbox and generator contained within the nacelle.

Tower: The tubular towers proposed for the Facility will be conical steel structures or a combination of steel and concrete, depending on final turbine selection. Each tower has a lockable access door, internal lighting and an internal ladder and lift to access the nacelle. In accordance with FAA regulations, the towers will be painted off-white to minimize visual impact.

Nacelle: The main mechanical and electrical components of the wind turbine are housed in the nacelle. The nacelle is mounted on a sliding ring that allows it to rotate, or "yaw,"

into the wind to maximize energy capture. The nacelle components include the drive train, gearbox, generator, and generator step-up transformer. The nacelle is housed in a steel-reinforced fiberglass shell that protects internal machinery from the environment. The housing is designed to allow for adequate ventilation to cool internal machinery. It is externally equipped with an anemometer and a wind vane to measure wind speed and direction. The generated electricity is conducted through cables within the tower to a switch enclosure mounted at the base of the turbine tower. Attached to the top of select nacelles, per FAA specifications, will be a single, medium-intensity aviation warning light. These will be red flashing lights that will be operated in accordance with FAA requirements. The FAA determines lighting specifications and determines which turbines must be equipped with lights.

Rotor: A rotor assembly is mounted on the drive shaft and operates upwind of the tower. Electric motors within the rotor hub vary the pitch of each blade according to wind conditions to maximize turbine efficiency at varying wind speeds.

Representative Potential Turbines: The below table lists the representative turbines currently being considered for the Facility. This list is not exhaustive of all potential turbine models or measurements that may be used for this Facility, and the final selected turbine may not be included on this list.

Manufacturer	Hub Height	Rotor Diameter	Tip Height	MW
General Electric	85m (279')	130m (427')	150m (492')	3.8 or 3.4
General Electric	90m (295')	116m (381')	148m (486')	2.5 or 2.3
Vestas	80m (262')	110m (361')	135m (443')	2.0
Vestas	95m (312')	110m (361')	150m (492')	2.0
General Electric	110m (361')	137m (449')	179m (586')	3.6

Regardless of the turbine model ultimately selected, the Facility layout will comply with all applicable County and State setback and sound requirements.

Allow 4.3 MW will use 485 ft. tall

Demand 6X's height from Base to tip min set back from property line

Access Roads

Existing public roads, private roads, and field paths will be utilized to the extent possible to access the Facility. The existing roads may require improvements before, during, or following construction. Where necessary, new access roads will be constructed between existing roadways and Facility components. The new and improved access roads will be all-weather, gravel surfaced, and generally 16 feet in width. During construction, some of the access roads will be widened to accommodate movement of the turbine erection crane with temporary widths generally not exceeding 36 feet.

Separate access may be required for the cranes used to erect the wind turbines. In such cases, temporary crane paths will be constructed between turbine locations. Following completion of construction, the temporary crane paths will be removed and the area restored, to the extent practicable.

Underground Electrical Collector Lines

The electrical collector lines will consist of an underground cable system between the collector substation and the individual turbine locations. The collector system will be designed for operation at 34.5 kV. The collector lines will be installed in a trench at least 30 inches below the ground to avoid potential impact from the existing land uses. A fiber-optic cable and an additional separate ground wire will also be installed with the collector system. The fiber-optic cable will be used for telemetry, control, and communication purposes. Above-ground junction boxes will be installed as required for connections or splices.

Meteorological Towers

Up to five permanent met towers will be installed as part of the Facility, with up to three of these located in Codington County. These met towers are used to obtain wind data for performance management once the Facility is operational. The met towers will be self-supporting with heights not to exceed the hub height of the wind turbines. The permanent met towers will be marked and lighted as specified by the FAA.

O&M Facility

An O&M facility will be constructed central to the Facility at a location well-suited for access to the turbines, as well as the substation and switching station. The facility will comprise a single- or two-story, 4,000-to-6,000 square-foot building, which will house operating personnel, offices, operations and communication equipment, parts storage and maintenance activities, and a vehicle parking area. An area for outdoor storage of larger equipment and materials will also be included within a fenced area for safety and security.

SCADA System

The Facility's design includes safety and control mechanisms. These mechanisms are generally monitored using a Supervisory Control and Data Acquisition ("SCADA") system. Each turbine is connected to the SCADA system via fiber-optic cable, which allows the turbines to be monitored in real time by the O&M staff. The SCADA system also allows the Facility to be remotely monitored, thus increasing Facility oversight, as well as the performance and reliability of the turbines. Not only will the local O&M office have full control of the wind turbines, but a 24/7 remote operations facility will also have control of the individual turbines. These two teams coordinate to ensure that the wind turbines operate safely and efficiently.

A third mechanism for safety and control is the turbines themselves. Each turbine monitors the wind speed and direction to ensure its current position is most efficient to produce electricity. This data is also used for feathering the blades; applying the brakes in high wind speeds or if there is ice build-up on the blades; and to tell the turbine when the wind is strong enough to begin turning the generator and producing electricity at the "cut-in" wind speed.

Construction

Once the Conditional Use Permits are approved and other state and federal approvals are obtained, Apex will complete engineering-scale design of the access roads, construction areas, turbine foundations, and the electrical components. This information will be submitted in conjunction with obtaining building permits. Construction of the on-site roads, tower foundations, and substation will take approximately 8 to 10 months. The

actual installation of the turbines will take approximately 2 to 3 months. Subject to receipt of the necessary permits and any weather delays, the Facility is slated to be operational during the fourth quarter of 2019, but that timeline could be moved up dependent on the construction timeline of the Big Stone South to Ellendale 345 kV line. For collection system trenching during construction, Dakota Range personnel and its contractors will remove topsoil prior to trenching and restore topsoil after trenching is completed. The contractor will typically decompact up to 10 inches below grade for crane paths post construction.

Dakota Range personnel and its contractors will confer closely with the South Dakota Department of Transportation ("SDDOT") and Codington and Grant Counties to manage construction traffic and safely deliver the various turbine components. Driveway Permits will be obtained from the SDDOT prior to construction.

Operation

The Facility will be operated and maintained by a team of approximately 10 personnel, including facility managers, a site manager, and a certified crew of technicians. This team will be at the project site or O&M building during normal business hours and will perform routine checks, respond to issues, and optimize the performance of the wind farm. The team will also have specified personnel on call 24 hours per day, seven days per week, should an issue arise outside of normal business hours.

During operations, the O&M staff will perform scheduled, preventive maintenance on the turbines. This is typically done in conjunction with representatives from the turbine manufacturer for the first one to three years.

Site Selection

The Dakota Range project site was selected through careful considerations of factors including wind speed, transmission availability, current land use, community input, and environmental impacts. First, the site has strong wind speeds for both the region as a whole and the immediate area and close proximity to transmission. The Big Stone South-to-Ellendale 345 kV line that is currently under construction will run through the Facility boundary, providing the Facility direct access to available transmission. Additionally, Apex seeks to site all wind energy projects in locations that are harmonious with the current land

use. In Codington County, the project footprint falls within land used primarily used for agriculture and pasture land, which lends itself well to a WES. The proposed Facility has received strong support from Codington County landowners in the project area. Lastly, Apex takes environmental concerns seriously, and works hard to minimize adverse impacts to sensitive environmental concerns, including critical habitat and species. Through preliminary desktop analysis and ongoing coordination and evaluation with the United States Fish and Wildlife Service as well as South Dakota Game, Fish and Parks, Dakota Range will minimize impacts to wetlands, grasslands, and local and migratory wildlife species.

Purpose

Electricity generated by the Facility will be connected to the high-voltage transmission grid through the Big Stone South-to-Ellendale 345 kV transmission line located on-site. The electricity will be either purchased by a third party, such as a utility company or an independent corporation, or sold on the open market. Though a third party will purchase the electricity, the specific electrons generated by the Facility will be utilized as needed on the MISO regional grid and cannot be tracked to their exact delivery location or final use. The electricity generated by the Facility will help MISO operators meet electricity demand in both the immediate and surrounding MISO control area. Any electricity not obligated under existing contracts will be sold in the MISO wholesale market for local and regional consumption. This Facility will also provide zero-emission cost electricity to the grid, as well as firm price stability due to the availability of a high-wind resource that will replace the need for ongoing fuel costs.

Project Benefits

Dakota Range will provide a variety of local benefits. During construction, a 300 MW wind project such as this Facility typically generates an immediate need for up to 500 temporary construction jobs over 9 months. Construction and operation of a typical 300 MW wind project results in the injection of millions of dollars into the local economy both immediately and throughout the life of the project. These investments will be seen throughout the community, including at hotels, restaurants, gas stations, auto repair companies, tire companies, grocery stores, and countless other local businesses. During

operation, the Facility will employ approximately 10 full-time personnel as facility managers, site managers, and turbine technicians. Furthermore, the Facility represents approximately a $500 million investment in Grant and Codington Counties. Dakota Range will pay taxes on the Facility, which will significantly increase the revenue available for a variety of local needs. Apex also likes to maintain an active presence in the local communities where it operates, and often sponsors local events and provides donations throughout the life of a project.

Necessary Future Permits

Additional permits and approvals are necessary for construction of the Facility, including, but not limited to:

- South Dakota Public Utilities Commission ("SDPUC") Facility Permit
  - Dakota Range will initiate the process with the SDPUC to obtain this permit.
- Federal Aviation Administration ("FAA") Determination of No Hazard
  - Dakota Range will obtain Determinations of No Hazard for each wind turbine and permanent met tower from the FAA.
- United States Army Corps of Engineers ("USACE") Clean Water Act Section 404
  - Dakota Range is designing the project to minimize impacts to jurisdictional waters of the U.S. and anticipates that the project can be built under a USACE nationwide permit with no required pre-construction notification. Dakota Range will obtain any permits required for compliance with Section 404 of the Clean Water Act.
- United States Fish and Wildlife Service ("USFWS") and South Dakota Game Fish & Parks ("SDGFP") Consultation
  - Dakota Range is working with the USFWS and SDGFP to avoid, minimize, and mitigate potential impacts to wildlife.
- United States Environmental Protection Agency National Pollutant Discharge Elimination System ("NPDES") Permit
  - Dakota Range will obtain coverage under a NPDES Stormwater Discharge General Permit, which requires preparation of a stormwater pollution prevention plan ("SWPPP").
- SDDOT Highway Access Approach and Utility Crossing Permits
  - Dakota Range will obtain access and utility crossing permits from the SDDOT, as necessary.
- Codington and Grant Counties Building, Utility Crossing, ROW Occupancy and Access Approach Permits

- Dakota Range will obtain building, utility crossing, ROW occupancy, and access approach permits from Codington and Grant Counties, as necessary.

Codington Participating Parcels						
Parcel ID	Acres	Landowner Name	PLLS Section	PLSS Township	PLSS Range	Parcel County
05000000301190521100000	151.6	AMDAHL ALLEN C	3	T119N	R052W	Codington
05000000301190521200000	134.5	AMDAHL ALLEN C	3	T119N	R052W	Codington
05000002201190523100000	144.2	AMDAHL ALLEN C.	22	T119N	R052W	Codington
05000001101190522100000	161.1	HEUER MAYNARD & DARLIS	2	T119N	R052W	Codington
05000000201190523100000	161.8	HEUER MAYNARD & DARLIS &	2	T119N	R052W	Codington
05000000101190521100000	150.8	KANNAS LEO & JEANETTE ETAL	36	T120N	R052W	Codington
05000000101190524100000	78.6	KANNAS LEO & JEANETTE ETAL	12	T119N	R052W	Codington
05000000101190524200000	78.8	KANNAS LEO & JEANETTE ETAL	1	T119N	R052W	Codington
05000001101190523100000	161.0	KLEINPRINTZ ELAINE & MICHAEL TRUSTE	14	T119N	R052W	Codington
05000001501190521100000	216.2	LAGODINSKI BRET & KRISTIE	22	T119N	R052W	Codington
05000001501190524100000	78.3	LAGODINSKI BRET & KRISTIE	15	T119N	R052W	Codington
05000001401190524100000	154.8	LETRUD GLORIA J. REVOCABLE TRUST	14	T119N	R052W	Codington
05000002301190521100000	155.6	LETRUD GLORIA J. REVOCABLE TRUST	23	T119N	R052W	Codington
05000001401190521400000	2.1	NOELDNER EUGENE W & LEONE A	14	T119N	R052W	Codington
05000001301190523100000	160.7	NOELDNER EUGENE W & LEONE A	14	T119N	R052W	Codington
05000001401190521100000	158.7	NOELDNER EUGENE W & LEONE A	14	T119N	R052W	Codington
05000001001190521100000	152.9	QUITSCH NEIL LARRY	3	T119N	R052W	Codington
11000000501190510000000	304.9	THOMPSON MELVIN & RONDA	32	T120N	R051W	Codington
05000000201190524100000	161.3	THOMPSON MELVIN L.	2	T119N	R052W	Codington
05000001101190521100000	160.8	THOMPSON MELVIN L.	2	T119N	R052W	Codington
05000002601190522100000	161.8	MARKVE KEITH ALLEN	22	T119N	R052W	Codington
05000002601190523100000	161.4	ZEMLICKA SHIRLEY & RODNEY TRUSTEES	26	T119N	R052W	Codington
05000000101190523100000	158.7	MACK EMIL	2	T119N	R052W	Codington
05000001201190522100000	157.6	MACK EMIL	12	T119N	R052W	Codington
05000003601190523100000	80.8	KAHNKE JABE R. % MARK KIENAST	36	T119N	R052W	Codington
05000003601190524100000	121.1	KAHNKE JABE R. % MARK KIENAST	36	T119N	R052W	Codington
14000000101180521100000	585.2	KAHNKE JABE R. % MARK KIENAST	2	T118N	R052W	Codington
05000001201190523100000	157.6	BERG JAMES B. & SUSAN J.	13	T119N	R052W	Codington
05000001301190522110000	146.8	BERG JAMES B. & SUSAN J.	14	T119N	R052W	Codington
05000001301190521100000	303.8	IMME R. R. FAMILY LLP	13	T119N	R052W	Codington
05000000401190524100000	178.1	ROSENFELD HUTTERIAN BRETHREN INC	4	T119N	R052W	Codington
05000002401190522100000	245.1	ROSENFELD HUTTERIAN BRETHREN INC	23	T119N	R052W	Codington
05000002401190524100000	191.6	ROSENFELD HUTTERIAN BRETHREN INC	19	T119N	R051W	Codington
11000000601190513100000	299.4	ROSENFELD HUTTERIAN BRETHREN INC	6	T119N	R051W	Codington
14000000301180523100000	300.9	STARK ALLEN D & DIANNE M	3	T118N	R052W	Codington
14000001001180521100000	295.5	STARK ALLEN D. & DIANNE M.	3	T118N	R052W	Codington
05000031012051R2100000	10.2	JOHNSON MICHAEL D. & NANCY J.	31	T120N	R051W	Codington
05000000301190522100000	135.6	JOHNSON MICHAEL D. & NANCY J.	4	T119N	R052W	Codington
05000000401190521100000	254.1	JOHNSON MICHAEL D. & NANCY J.	9	T119N	R052W	Codington
05000000601195IR1100000	157.7	JOHNSON MICHAEL D. & NANCY J.	6	T119N	R051W	Codington
05000000801190521400000	46.7	JOHNSON MICHAEL D. & NANCY J.	16	T119N	R052W	Codington
05000001701190521100000	99.8	JOHNSON MICHAEL D. & NANCY J.	16	T119N	R052W	Codington
05000003001205IR2300000	158.7	JOHNSON MICHAEL D. & NANCY J.	30	T120N	R051W	Codington
05000003101205IR1100000	161.5	JOHNSON MICHAEL D. & NANCY J.	6	T119N	R051W	Codington
05000003101205IR3200000	306.7	JOHNSON MICHAEL D. & NANCY J.	6	T119N	R051W	Codington
05000003001205IR3400000	71.7	JOHNSON MICHAEL D. & NANCY J.	30	T120N	R051W	Codington
05000003501190522100000	160.7	BUCHHOLZ COLETTA	35	T119N	R052W	Codington
05000003601190523200000	80.6	BUCHHOLZ COLETTA	36	T119N	R052W	Codington
14000000201180522100000	160.5	BUCHHOLZ COLETTA	2	T118N	R052W	Codington
14000000201180521100000	317.1	BUCHHOLZ COLETTA	2	T118N	R052W	Codington
14000000201180524100000	153.8	BUCHHOLZ COLETTA	2	T118N	R052W	Codington
14000000201180524400000	6.8	THRUN WILLIAM & RAASCH ARDYS	2	T118N	R052W	Codington
14000001101180522100000	158.4	THRUN WILLIAM & RAASCH ARDYS	2	T118N	R052W	Codington
05000002101190524100000	40.2	BESKOW JAMES	21	T119N	R052W	Codington
05000002101190524400000	40.2	BESKOW JAMES & MAVIS	21	T119N	R052W	Codington
05000003301190524100000	160.7	BESKOW JAMES & MAVIS	4	T118N	R052W	Codington
05000003301190523100000	160.1	BESKOW JAMES EA	32	T119N	R052W	Codington
14000001101180521100000	156.7	MOHR ROGER D.	2	T118N	R052W	Codington
05000000901190522100000	132.1	SIEH RANDY	9	T119N	R052W	Codington
05000000901190522200000	85.5	SIEH RANDY	9	T119N	R052W	Codington

11000001901190511200000	96.4	NEUGEBAUER KATHLEEN	19	T119N	R051W	Codington
14000000301180521100000	80.8	KANNAS TIM V	3	T118N	R052W	Codington
05000003401190524100000	141.7	KANNAS TIM V.	34	T119N	R052W	Codington
05000003501190523100000	160.3	KANNAS TIM V.	35	T119N	R052W	Codington
05000003501190524100000	80.2	KANNAS TIM V.	35	T119N	R052W	Codington
14000000301180521200000	70.1	KANNAS TIM V.	3	T118N	R052W	Codington
05000003401190522200000	212.7	BUNDE DARLIS J	28	T119N	R052W	Codington
14000000301180522100000	153.9	BUNDE DARLIS J	3	T118N	R052W	Codington
05000003101190524100000	170.6	BUNDE MERLIN E	6	T118N	R052W	Codington
05000003201190523100000	318.6	BUNDE LARIN L.	32	T119N	R052W	Codington
14000000401180521100000	161.6	BUNDE EDGAR O TRUST	4	T118N	R052W	Codington
05000003401190521100000	228.3	ZUBKE JACKIE L & GRACE M	34	T119N	R052W	Codington
05000002501205 2R1200000	124.7	FALK FARMS INC	25	T120N	R052W	Codington
05000001001190523100000	74.8	MOYER CLAYTON E. & ALICE I.	9	T119N	R052W	Codington
14000001101180524100000	161.4	MOHR ROGER	11	T118N	R052W	Codington
14000001201180521100000	160.1	MOHR ROGER D.	12	T118N	R052W	Codington
14000001201180522100000	151.0	MOHR ROGER D.	12	T118N	R052W	Codington
14000001101180523100000	159.3	PESTER ROLAND E.	11	T118N	R052W	Codington
1448850010118052440000 0	33.7	BRESKE TONY & GWEN	1	T118N	R052W	Codington
05000000901190521100000	17.5	HEUER DENNIS & SALLY ETAL	9	T119N	R052W	Codington
05000000901190522300000	60.6	HEUER DENNIS & SALLY ETAL	9	T119N	R052W	Codington
05000003601205 2R4100000	157.6	AMDAHL ALLEN C	1	T119N	R052W	Codington
05000002701190521100000	304.9	KAZEMBA KIMBERLY	22	T119N	R052W	Codington
05000002701190523100000	303.6	KAZEMBA KIMBERLY	28	T119N	R052W	Codington
05000000201190521100000	142.2	GRABOW TYLER & HILARY	2	T119N	R052W	Codington
05000000101190522100000	149.8	GRABOW TYLER & HILARY	36	T120N	R052W	Codington
05000000201190522100000	144.6	GRABOW TYLER & HILARY	2	T119N	R052W	Codington
05000001501190522100000	146.5	BUNDE ALAINE	16	T119N	R052W	Codington
05000001001190523300000	74.3	BUNDE ALAINE L.	9	T119N	R052W	Codington
05000002201190521100000	148.0	KORTH ROLLO C. FAMILY TRUST	22	T119N	R052W	Codington
05000002801190522100000	160.9	A M FARMS INC	28	T119N	R052W	Codington
05000000901190523100000	158.6	JOHNSON MICHAEL D. & NANCY J.	9	T119N	R052W	Codington
05000000901190523300000	158.6	JOHNSON MICHAEL D. & NANCY J.	16	T119N	R052W	Codington
05000002201190521 1A0000	132.8	KORTH DAVID R. & DIXIE K.	22	T119N	R052W	Codington
05000002101190523100000A	231.4	A M FARMS INC	20	T119N	R052W	Codington

Filed in - Grant County, Milbank, SD
Recorded on 2/27/2015 2:30 PM
Transaction # 1002781
Document # 229025
Book 271
Page 480 (5 pages) Rec. Fee $30.00
Nancy Copeland
Nancy Copeland, Register of Deeds
Return To:
WAHPETON WIND
200 ROYAL OAKS BLVD, A3
FRANKLIN, TN 37067

RECORDING REQUESTED BY,
AND AFTER RECORDING,
RETURN TO:
DHan James, Project Administrator
Wahpeton Wind, LLC
200 Royal Oaks Blvd, A3
Franklin, TN 37067
Tele: 615.418.3210

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, **effective on** January 29, 2015, by and between Allen C. Amdahl (collectively or individually, the "**Landowner**"), whose **address is** P.O. Box 704, Summit, SD 57266, and **WAHPETON WIND FARM, LLC,** a Colorado limited liability company ("**Lessee**"), whose address is 125 South Howes Street, Suite 870, Fort Collins, CO 80521, in light of the following facts and circumstances:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Grant/Codington County, South Dakota, as more particularly described on **Exhibit A** attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, **Landowner and Lessee hereby agree** as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

INSTRUMENT NO. 201501340 Pages: 5
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 4988

4/9/2015 9:50:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: WAHPETON WIND LLC

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate; and

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more turbines on the Property or on other property within the Project, and any such wind turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18)

months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signatures appear on the next Page

IN WITNESS WHEREOF, Landowner and Lessee have caused this Lease Short Form to be executed and delivered by their duly authorized representatives as of the date first written above.

LESSEE: **WAHPETON WIND, LLC,**
a Colorado limited liability company

By: Jim Newcomb
Printed Name: Jim Newcomb

Title: Manager

STATE OF Colorado COUNTY OF Larimer (Where signed)

The foregoing instrument was subscribed and acknowledged before me this 17th day of February, 20 15, by Jim Newcomb, a Representative of the Colorado limited liability company, on behalf of the limited liability company.

KATE MILLER
Notary Public
State of Colorado
Notary ID 20014008717
My Commission Expires Mar 20, 2017

Kate Miller
Notary Public for Colorado

My commission expires: 3-20-2017

LANDOWNER:

By: Allen C. Amdahl
Printed Name: Allen C. Amdahl

By: _____

Printed Name: _____

STATE OF South Dakota COUNTY OF Roberts (Where signed)

This instrument was subscribed and acknowledged before me on this 29th day of January, 20 15, by Allen Amdahl

Notary Public for Roberts County

My commission Expires: 1-9-19

Exhibit A

Description of the Property (Allen C. Amdahl)

All that real property located in Grant/Codington County, South Dakota, described as follows:

The Southwest Quarter (SW1/4) of Section Thirty One (31), Township One Hundred Twenty One (121) North of Range Fifty One (51) West of the Fifth Principal Meridian.
(158.37 acres) In the former Sisseton and Wahpeton Indian Reservation N/A

The Southeast Quarter, Except Lot One (1), Frank and Brenda Redlin Subdivision, and Except the North Half of the Northeast Quarter of the Northeast Quarter of the Southeast Quarter (N1/2 NE1/4 NE1/4 SE1/4), all located in the Southeast Quarter (SE1/4), of Section Thirty – One (31), Township One Hundred Twenty – One (121) North, Range Fifty – One (51) West of the 5th P.M., Grant County, South Dakota, In the Former Sisseton and Wahpeton Indian Reservation, subject to easements and reservations of record or visible upon the property.
(154 acres)

The Northwest Quarter (NW1/4) of Section Five (5), Township One hundred Twenty (120) North of Range Fifty-One (51) West of the Fifth Principal Meridian, Grant County, South Dakota, and subject to easements and reservations of record. In the former Sisseton and Wahpeton
(157 acres) Indian Reservation N/A

West Half (W1/2), also described as Lots Three (3), Four (4), Five (5), Six (6) and Seven (7) and the Southeast Quarter of the Northwest Quarter (SE1/4 NW1/4) and the East Half of the Southwest Quarter (E1/2 SW1/4), except Lot A and except Lot One (1), Prairie View Subdivision in the Northwest Quarter (NW1/4), all in Section Six (6), Township One Hundred Twenty (120) North, Range Fifty – One (51) West of the 5th P.M., in the Former Sisseton and Wahpeton Indian Reservation, Grant County, South Dakota, subject to all patent reservations, vested drainage rights, highway rights of way easements and easements of record or actually existing on the premises.

South Half of the Northeast Quarter and Lots 1 and 2 in Section 6, Township 120 North, Range 51 West of the 5th P.M., in the Former Sisseton and Wahpeton Indian Reservation, Grant County, South Dakota, subject to easements and reservations of record or visible upon the property.
(436 acres)

Lots Two and Three (2 & 3), Dummann Second Subdivision in the South Half (S1/2), of Section Twenty-Six (26), Township One hundred Twenty (120) North, Range Fifty-Two (52) West of the 5th P.M., Grant County, South Dakota, Subject to Easements and reservations of record or visible upon the property.
(160 acres)

Lots 1 and 2 and the South Half of the Northeast Quarter and the Southeast Quarter, also described as the East Half (except Lot H-1 in the Southeast Quarter and except Lot H-1 in the Northeast Quarter) of Section 3, Township 119 North, Range 52, West of the 5th P.M. Codington County, South Dakota.
(299 acres)

INSTRUMENT NO. 201505153 Pages: 5
BOOK: 4T EASEMENT
PAGE: 5439

11/16/2015 11:37:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

RECORDING REQUESTED BY,
AND AFTER RECORDING,
RETURN TO:
Wahpeton Wind, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, **effective on** February 12, 20 15, by and between Maynard Heuer & Darlis Heuer husband and wife (collectively or individually, the "**Landowner**"), whose **address is** 15484 458th Ave. South Shore, S.D. 57263, and **WAHPETON WIND, LLC,** a Colorado limited liability company ("**Lessee**"), whose address is 125 South Howes Street, Suite 870, Fort Collins, CO 80521, in light of the following facts and circumstances:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Grant / Codington County, South Dakota, as more particularly described on **Exhibit A** attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, **Landowner and Lessee hereby agree** as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate; and

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more turbines on the Property or on other property within the Project, and any such wind turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18)

months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signatures appear on the next Page

IN WITNESS WHEREOF, Landowner and Lessee have caused this Lease Short Form to be executed and delivered by their duly authorized representatives as of the date first written above.

LESSEE: **WAHPETON WIND, LLC,**
a Colorado limited liability company

By: Jim Newcomb

Printed Name: Jim Newcomb

Title: Manager

STATE OF Colorado COUNTY OF Larimer (Where signed)

The foregoing instrument was subscribed and acknowledged before me this 17th day of February, 2015, by Jim Newcomb, a Representative of the Colorado limited liability company, on behalf of the limited liability company.

KATE MILLER
Notary Public
State of Colorado
Notary ID 20014008717
My Commission Expires Mar 20, 2017

Kate Miller
Notary Public for Colorado

My commission expires: 3-20-2017

LANDOWNER:

By: Maynard Heuer

Printed Name: Maynard Heuer

By: Darlis Heuer

Printed Name: Darlis Heuer

STATE OF South Dakota COUNTY OF Codington (Where signed)

This instrument was subscribed and acknowledged before me on this 13 day of February, 2015, by Maynard and Darlis Heuer, husband & wife.

DEBBIE MELVILLE
SEAL NOTARY PUBLIC SOUTH DAKOTA SEAL

Notary Public for Debbie Melville

My commission Expires: My Commission Expires March 24, 2017

Exhibit A

Description of the Property

All that real property located in County, South Dakota, described as follows:

Grant Cty - Lura Twp 120-51 S1/2NW1/4 and NW1/4NW1/4 Sec 17
(120 acres)

Codington Cty - Germantown Twp 119-52 NW1/4 Sec 11
(160 acres)

Codington Cty - Germantown Twp 119-52 – 100 acres of (SW1/4) Sec 2
(100 acres)

Maynard Heuer and Darlis Heuer

INSTRUMENT NO. 201601194 Pages: 5
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 5760

3/28/2016 11:27:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

RECORDING REQUESTED BY, PREPARED BY,
AND AFTER RECORDING,
RETURN TO:
Wahpeton Wind, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, **effective on** March 8th, 20 15, by and between Terry Kannas and Darla Kannas, husband and wife; and Leo Kannas and Jeanette Kannas, husband and wife (collectively or individually, the "**Landowner**"), whose **address is** 2015 West Kemp, Watertown, SD 57201, and **WAHPETON WIND, LLC,** a Colorado limited liability company ("**Lessee**"), whose address is 125 South Howes Street, Suite 870, Fort Collins, CO 80521, in light of the following facts and circumstances:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on **Exhibit A** attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, **Landowner and Lessee hereby agree** as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate; and

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more turbines on the Property or on other property within the Project, and any such wind turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18)

months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signatures appear on the next Page

IN WITNESS WHEREOF, Landowner and Lessee have caused this Lease Short Form to be executed and delivered by their duly authorized representatives as of the date first written above.

LESSEE: **WAHPETON WIND, LLC,**
a Colorado limited liability company

By: Patrick N. Adams
Printed Name: Patrick N Adams
Title: Project Administrator

STATE OF South Dakota COUNTY OF Codington (Where signed)

The foregoing instrument was subscribed and acknowledged before me this 9 day of April, 2015, by Patrick N Adams, a Representative of the Colorado limited liability company, on behalf of the limited liability company.

DEBBIE MELVILLE
SEAL NOTARY PUBLIC SEAL
SOUTH DAKOTA

Notary Public for Debbie Melville
My commission expires: My Commission Expires March 24, 2017

LANDOWNER:

By: Terry Kannas Darla Kannas
Printed Name: Terry Kannas
By: Leo Kannas Darla Kannas Jeanette Kannas
Printed Name: Leo Kannas Jeanette Kannas

STATE OF SOUTH DAKOTA COUNTY OF CODINGTON (Where signed)

This instrument was subscribed and acknowledged before me on this 19 day of MARCH, 2015, by Courtney L Livingston.

COURTNEY L LIVINGSTON
SEAL NOTARY PUBLIC SEAL
SOUTH DAKOTA

Notary Public for STATE OF SOUTH DAKOTA
My commission Expires: 11-07-2015

EXHIBIT A

Description of the Property

All that real property located in Codington County, South Dakota, described as follows:

The East Half of Section 1, Township 119 North, Range 52 West of the 5th P.M., Codington County, South Dakota
(320 acres)

RECORDING REQUESTED BY,
AND AFTER RECORDING,
RETURN TO:
DHan James, Project Administrator
Wahpeton Wind, LLC
200 Royal Oaks Blvd, A3
Franklin, TN 37067
Tele: 615.418.3210

INSTRUMENT NO. 201500927 Pages: 5
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 4930

3/12/2015 11:16:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: WAHPETON WIND LLC

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on March 8th, 2015, by and between Terry Kamas (collectively or individually, the "**Landowner**"), whose **address is** 2015 West Kemp Watertown, S.D. 57201, and **WAHPETON ~~WIND~~, LLC**, a Colorado limited liability company ("**Lessee**"), whose address is 125 South Howes Street, Suite 870, Fort Collins, CO 80521, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. Lease of Property; Easements. Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the **"Development Period"**). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the **"First Renewal Term"**). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the **"Second Renewal Term"**). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its

original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

WAHPETON WIND, LLC,
a Colorado limited liability company

By: Patrick N. Adams
Name: Patrick N. Adams
Title: Project Administrator

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

The foregoing instrument was acknowledged before me this 12 day of March, 2015, by Patrick N. Adams, Project Administrator of **Wahpeton Wind, LLC**, a Colorado limited liability company, on its behalf.

Witness my hand and official seal.

Cindy Brugman
Notary Public for Codington Co., SD
My commission expires: 4-22-2020

CINDY BRUGMAN
NOTARY PUBLIC
SOUTH DAKOTA
SEAL SEAL

LANDOWNER:

By: Terry Kannon
Printed Name: Terry Kannas

By: _____
Printed Name: _____

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 8th day of March, 2015, before me, the undersigned officer, personally appeared Terry Kannas, husband and wife/a married person/a single person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.



Kathleen Meyer
Notary Public for Cod. Co. SD
My commission expires: 4/22/2015

EXHIBIT A

Description of the Property

All that real property located in Codington County, South Dakota, described as follows:

The East Half of Section 1, Township 119 North, Range 52 West of the 5th P.M., Codington County, South Dakota
(320 acres)

Terry Kannas and Darla Kannas

RECORDING REQUESTED BY,
AND AFTER RECORDING,
RETURN TO:
DHan James, Project Administrator
Wahpeton Wind, LLC
200 Royal Oaks Blvd, A3
Franklin, TN 37067
Tele: 615.418.3210

INSTRUMENT NO. 201500926 Pages: 5
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 4929

3/12/2015 11:15:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: WAHPETON WIND LLC

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, **effective on** February 27, 2015, by and between ELAINE M. KLEINFRINTZ REVOCABLE TRUST (collectively or individually, the "**Landowner**"), whose **address is** 1501 Muir Ln, Burnsville MN 55337, and **WAHPETON WIND ~~FARM~~ J.N., LLC,** a Colorado limited liability company ("**Lessee**"), whose address is 125 South Howes Street, Suite 870, Fort Collins, CO 80521, in light of the following facts and circumstances:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on **Exhibit A** attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, **Landowner and Lessee hereby agree** as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate; and

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more turbines on the Property or on other property within the Project, and any such wind turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18)

months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signatures appear on the next Page

IN WITNESS WHEREOF, Landowner and Lessee have caused this Lease Short Form to be executed and delivered by their duly authorized representatives as of the date first written above.

LESSEE: **WAHPETON WIND, LLC,**
a Colorado limited liability company

By: Dhan James
Printed Name: DHAN JAMES
Title: Asst. Project Manager

STATE OF Tennessee COUNTY OF Williamson (Where signed)

~~DHAN JAMES~~ The foregoing instrument was subscribed and acknowledged before me this 27th day of February, 2015, by DHAN JAMES, a Representative of the Colorado limited liability company, on behalf of the limited liability company.

JEIMY STEFANNY DIAZ
STATE OF TENNESSEE NOTARY PUBLIC
DAVIDSON COUNTY

Notary Public for Davidson County TN
My commission expires: May 13 2016

Jeimy S. Diaz

LANDOWNER:

By: Elaine Kleinprintz
Printed Name: Elaine Kleinprintz
Elaine M. Kleinprintz, Trustee of Elaine M. Kleinprintz Revocable Trust dtd
By:
Printed Name: Elaine Marie Kleinprintz

STATE OF Minnesota COUNTY OF Dakota (Where signed)

This instrument was subscribed and acknowledged before me on this 17th day of February, 2015, by Elaine Marie Kleinprintz.

ELINA SLUTSKY
NOTARY PUBLIC - MINNESOTA
MY COMMISSION EXPIRES 01/31/18

Notary Public for Dakota County
My commission Expires: 01/2011

02/17/15

LANDOWNER:

By: Allen D Stark
Name: Allen D. Stark

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 30th day of June, 2015 before me, the undersigned officer, personally appeared Allen D. Stark, a married person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that (he)/~~she/they~~ executed the same for the purpose therein contained.

Witness my hand and official seal.

SUE JEFFERS NOTARY Seal PUBLIC STATE OF SOUTH DAKOTA

Sue Jeffers
Notary Public for South Dakota
My commission expires: 7-27-18

By: Dianne M Stark
Name: Dianne M. Stark

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 30th day of June, 2015 before me, the undersigned officer, personally appeared Dianne M. Stark, a married person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that ~~he/~~(she)/~~they~~ executed the same for the purpose therein contained.

Witness my hand and official seal.

SUE JEFFERS NOTARY Seal PUBLIC STATE OF SOUTH DAKOTA

Sue Jeffers
Notary Public for South Dakota
My commission expires: 7-27-18

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

Tract 1:

The North Half (N½) of Section 10, Township 118 North, Range 52 West of the 5th P.M., except Lot H-1 contained therein, Codington County, South Dakota.

Tract 2:

The South Half (S½) of Section 3, Township 118 North, Range 52 West of the 5th P.M., except Lot H-1 contained therein, Codington County, South Dakota.

Less and except the following:

The West 400 Feet of the South 150 Feet of the North 1,368 Feet of the Northwest Quarter of Section 10, Township 118 North, Range 52 West of the 5th Principal Meridian, Codington County, South Dakota, containing 1.38 acres, more or less.

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201505151 Pages: 7
BOOK: 4T EASEMENT
PAGE: 5437

11/16/2015 11:35:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on August 27, 2015, by and between Michael D. Johnson and Nancy J. Johnson, husband and wife (collectively or individually, the "**Landowner**"), whose address is 14962 483rd Ave, Milbank, SD 57252, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County and Grant County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the

Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 9th day of September, 2015 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

_____
Notary Public

ANN LEIGH WATTS
Notary Public - Reg. # 7615616
Commonwealth of Virginia
My Commission Expires Mar. 31, 2018

LANDOWNER:

By: Michael D Johnson
Name: Michael D. Johnson

STATE OF SOUTH DAKOTA)
) ss.
COUNTY OF GRANT)

On this 27th day of August, 2015, before me, the undersigned officer, personally appeared Michael D. Johnson, a married person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

GEORGE B. BOOS SEAL NOTARY PUBLIC SEAL SOUTH DAKOTA

George B. Boos
Notary Public for South Dakota
My commission expires: 11/02/2016

By: Nancy J. Johnson
Name: Nancy J. Johnson

STATE OF SOUTH DAKOTA)
) ss.
COUNTY OF GRANT)

On this 27th day of August, 2015, before me, the undersigned officer, personally appeared Nancy J. Johnson, a married person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

GEORGE B. BOOS SEAL NOTARY PUBLIC SEAL SOUTH DAKOTA

George B Boos
Notary Public for South Dakota
My commission expires: 11/02/2016

EXHIBIT "A"

Description of Property

All that real property located in Codington County and Grant County, South Dakota, described as follows:

Tract 1:

Government Lots 3 and 4 and the South Half of the Northwest Quarter (S1/2NW1/4), which has also been described as the Northwest Quarter (NW1/4), less Lot H-1, in Section 3, Township 119 North, Range 52 West of the 5th P.M., Codington County, South Dakota.

Tract 2:

The Southeast Quarter of the Southwest Quarter (SE1/4SW1/4) and Government Lot 6, in Section 30, Township 120 North, Range 51 West of the 5th P.M., in the Sisseton and Wahpeton Indian Reservation, Codington County, South Dakota.

Tract 3:

Government Lots 1 and 2 and the South Half of the Northeast Quarter (S1/2NE1/4) and Government Lots 3, 4, 5 and 6 and the Southeast Quarter (SE1/4), which has also been described as the East One-Half (E1/2) and Lots 3 through 6, in Section 4, Township 119 North, Range 52 West of the 5th P.M., Codington County, South Dakota.

Tract 4:

The Northwest Quarter of the Northeast Quarter (NW1/4NE1/4) and Government Lots 1, 2, 3 and 4 in Section 31, Township 120 North, Range 51 West of the 5th P.M., in the Sisseton and Wahpeton Indian Reservation, Codington County, South Dakota.

Tract 5:

Government Lots 1, 2, 3 and 4, less road right of way in Government Lots 2 and 3, all in Section 6, Township 119 North, Range 51 West of the 5th P.M., in the Sisseton and Wahpeton Indian Reservation, Codington County, South Dakota.

Tract 6:

The South 214 Feet of the West 878 Feet of Government Lot 6, and the North 321 Feet of the West 878 Feet of Government Lot 7, all located in Section 31, Township 120 North, Range 51 West of the 5th P.M., in the Sisseton and Wahpeton Indian Reservation, less Lot H-2, and subject to additional public right of way, Codington County, South Dakota.

Tract 7:

All of Government Lot 5, Government Lot 6 less the South 214 Feet of the West 878 Feet, Government Lot 7 less the North 321 Feet of the West 878 Feet and Government Lot 8 less Lot H2, and the East Half of the Northwest Quarter (E1/2NW1/4); and the East Half of the Southwest Quarter (E1/2SW1/4) of Section 31, Township 120 North, Range 51 West of the 5th P.M., Codington County, South Dakota, which has also been described as the West Half (W1/2) of Section 31, Township 120 North, Range 51 West of the 5th P.M., less the South 214 Feet of the West 878 Feet of the Northwest Quarter (NW1/4) and the North 321 Feet of the West 878 Feet of the Southwest Quarter (SW1/4) thereof, less Lot H2 and subject to public right of way, all being in the Sisseton-Wahpeton Indian Reservation, Codington County, South Dakota.

Tract 8:

Government Lot 2, Government Lots 3 and 4 subject to public right of way, and the Southeast Quarter of the Northwest Quarter (SE1/4NW1/4), also described as the West Half of the Southwest Quarter (W1/2SW1/4) and the South Half of the Northwest Quarter (S1/2NW1/4), all in Section 30, Township 120 North, Range 51 West of the 5th P.M., less Lot H-2 thereof, all being in the Sisseton-Wahpeton Indian Reservation, Codington County, South Dakota.

Tract 9:

Government Lots 1 and 2 of Section 8, Township 119 North, Range 52 West of the 5th P.M., Codington County, South Dakota.

Tract 10:

Government Lots 1 and 2 and the Southeast Quarter of the Northeast Quarter (SE1/4NE1/4) of Section 17, Township 119 North, Range 52 West of the 5th P.M., Codington County, South Dakota.

Tract 11:

The Northeast Quarter (NE1/4), except Lot H-1, of Section 12, Township 120 North, Range 52 West of the 5th P.M., in the former Sisseton and Wahpeton Indian Reservation, Grant County, South Dakota.

Tract 12:

The South Half of the Southwest Quarter (S1/2SW1/4) of Section 12, Township 120 North, Range 52 West of the 5th P.M., in the former Sisseton and Wahpeton Indian Reservation, Grant County, South Dakota.

Tract 13:

The Southeast Quarter (SE1/4), except Timber Line Addition and except a 17 foot strip of land along the east side, of Section 12, Township 120 North, Range 52 West of the 5th P.M., in the former Sisseton and Wahpeton Indian Reservation, Grant County, South Dakota.

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201505150 Pages: 6
BOOK: 4T EASEMENT
PAGE: 5436

11/16/2015 11:34:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on October 8, 2015, by and between Coletta Buchholz, a single/~~married~~ person (collectively or individually, the "**Landowner**"), whose address is 16026 458th Ave, Watertown, SD 57201, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed

unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 19th day of October, 2015 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

Ann Leigh Watts
Notary Public

ANN LEIGH WATTS
Notary Public - Reg. # 7615616
Commonwealth of Virginia
My Commission Expires Mar. 31, 2018

LANDOWNER:

By: Coletta Buchholz
Name: Coletta Buchholz

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 8th day of October, 2015, before me, the undersigned officer, personally appeared Coletta Buchholz, a married person/a single person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.



Maynard Heuer
Notary Public for State of South Dakota
My commission expires: 7-15-2021

The undersigned spouse is joining this Agreement to acknowledge and accept its contents and to ratify the Agreement as applicable to his/her interest in the Property.

By: _____
Name:

STATE OF _____)
) ss.
COUNTY OF _____)

On this ____ day of _____, 201_, before me, the undersigned officer, personally appeared _____, a married person/a single person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

_____
Notary Public for _____
My commission expires: _____

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

Tract 1:

East Half(E1/2) of Section 2, Township 118 North, Range 52 West of the 5th P.M., Codington County, South Dakota

Tract 2:

Northwest Quarter(NW1/4) of Section 2, Township 118 North, Range 52 West of the 5th P.M., Codington County, South Dakota

Tract 3:

Southwest Quarter(SW1/4) less the East 33 Rods of the South 33 Rods of Section 2, Township 118 North, Range 52 West of the 5th P.M., Codington County, South Dakota

Tract 4:

Northwest Quarter(NW1/4) of Section 35, Township 119 North, Range 52 West of the 5th P.M., Codington County, South Dakota

Tract 5:

West Half of the Southwest Quarter(W1/2SW1/4) of Section 36, Township 119 North, Range 52 West of the 5th P.M., Codington County, South Dakota

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201505687 Pages: 8
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 5499

12/21/2015 12:35:00 PM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on October 23, 2015, by and between William Thrun, a single / married person; Ardys Raasch, a single / married person; and Anita Thrun, a single / married person (collectively or individually, the "**Landowner**"), whose address is 18071 457th Ave., Castlewood, SD 57223, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be

binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 6th day of November, 2015 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

Ann Leigh Watts
Notary Public

ANN LEIGH WATTS
Notary Public - Reg. # 7615616
Commonwealth of Virginia
My Commission Expires Mar. 31, 2018

LANDOWNER:

By: William Thrun
Name: William Thrun

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 14th day of August, 2015 before me, the undersigned officer, personally appeared William Thrun, a single / married person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

BARBARA A. KRANZ
NOTARY PUBLIC
SOUTH DAKOTA
SEAL SEAL

Barb Kranz
Notary Public for Dakotah Bank
My commission expires: 10-25-2020

By: N/A
Name:

STATE OF _____)
) ss.
COUNTY OF _____)

On this ____ day of _____, 201_, before me, the undersigned officer, personally appeared _____, a married person/a single person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

_____
Notary Public for _____
My commission expires: _____

By: Ardys Raasch
Name: Ardys Raasch

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 14 day of October, 2015, before me, the undersigned officer, personally appeared Ardys Raasch, a single / ~~married person~~, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

MITCH ANDERSON
SEAL SEAL
NOTARY PUBLIC
SOUTH DAKOTA

Notary Public for Codington County
My commission expires: 8/19/20

By: Jerry Raasch
Name: Jerry Raasch

STATE OF South Dakota)
) ss.
COUNTY OF codington)

On this 23 day of October, 2015 before me, the undersigned officer, personally appeared Jerry Raasch, a ~~married person~~/a single person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

ANTONIO MONTEZAYOR JR
SEAL NOTARY PUBLIC SOUTH DAKOTA SEAL

Notary Public for Codington county
My commission expires: 10-14-17

By: Anita Thrun
Name: Anita Thrun

STATE OF SD)
) ss.
COUNTY OF Day)

On this 12 day of Oct, 2015, before me, the undersigned officer, personally appeared Anita Thrun, a single married person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

BARBARA NILES
NOTARY PUBLIC
DAY COUNTY
SOUTH DAKOTA
SEAL SEAL

Barbara Niles
Notary Public for SD
My commission expires: 1-17-2020

By: N/A
Name:

STATE OF _____)
) ss.
COUNTY OF _____)

On this ____ day of _____, 201_, before me, the undersigned officer, personally appeared _____, a married person/a single person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

_____
Notary Public for _____
My commission expires: _____

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

Tract 1:

The Northwest Quarter of Section 11, Township 118 North, Range 52 West of the 5th P.M., less highway rights of way

Parcel number: 14000001101180522100000 (155.98 acres)

Tract 2:

The East 33 Rods of the South 33 Rods of the Southwest Quarter of Section 2, Township 118 North, Range 52 West of the 5th P.M., all in Codington County, South Dakota

Parcel number: 14000000201180524400000 (6.80 acres)

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201505688 Pages: 6
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 5500

12/21/2015 12:36:00 PM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on October 29, 2015, by and between James Beskow and Mavis Beskow, husband and wife (collectively or individually, the "**Landowner**"), whose address is 15974 456th Ave., Watertown, SD 57201, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed

unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 1st day of December, 2015 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

Ann Leigh Watts
Notary Public

ANN LEIGH WATTS
Notary Public - Reg. # 7615616
Commonwealth of Virginia
My Commission Expires Mar. 31, 2018

LANDOWNER:

By: James Beskow
Name: James Beskow

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 29 day of October, 2015 before me, the undersigned officer, personally appeared James Beskow, a married person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

MAYNARD HEUER NOTARY SEAL PUBLIC SOUTH DAKOTA

Maynard Heuer
Notary Public for State of South Dakota
My commission expires: 7-15-2021

By: Mavis Beskow
Name: Mavis Beskow

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 29 day of October, 2015 before me, the undersigned officer, personally appeared Mavis Beskow, a married person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

MAYNARD HEUER NOTARY SEAL PUBLIC SOUTH DAKOTA

Maynard Heuer
Notary Public for State of South Dakota
My commission expires: 7-15-2021

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

Tract 1:

The Northeast Quarter of the Southeast Quarter of Section 21, Township 119 North, of Range 52, West of the 5th P.M.

Parcel number: 05000002101190524100000 (40.00 acres)

Tract 2:

The Southeast Quarter of the Southeast Quarter (SE 1/4 SE 1/4) of Section 21, Township 119 North, Range 52 West of the 5th P.M.,

Parcel number: 05000002101190524400000 (40.00 acres)

Tract 3:

The Southeast Quarter (SE 1/4) of Section 33, Township 119 North, Range 52, West of the 5th P.M.

Parcel number: 05000003301190524100000 (160.00 acres)

Tract 4:

The Southwest Quarter (SW 1/4) of Section Thirty Three (33), Township 119, Range 52, West of the 5th P.M., less the South 6 Rods of the West 7 Rods of said tract.

Less and Except:

Schick Addition in the Southwest Quarter (SW1/4) of Section 33, Township 119 North, Range 52West of the 5th P.M., in the County of Codington, South Dakota.

Parcel number: 05000003301190523100000 (157.40 acres)

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201505689 Pages: 6
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 5501

12/21/2015 12:37:00 PM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on October 29, 2015, by and between Roger D. Mohr, as Trustee under the Roger D. Mohr Living Trust, dated July 8, 2010 (collectively or individually, the "**Landowner**"), whose address is 16146 459th Ave., Watertown, SD 57201, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the **"Development Period"**). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the **"First Renewal Term"**). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the **"Second Renewal Term"**). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and

decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 1st day of December, 2015 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

_____
Notary Public

ANN LEIGH WATTS
Notary Public - Reg. # 7615616
Commonwealth of Virginia
My Commission Expires Mar. 31, 2018

LANDOWNER:

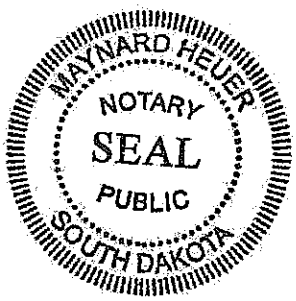
The Roger D. Mohr Living Trust, dated July 8, 2010

By: Roger D Mohr Trustee
Name: Roger D. Mohr, as Trustee

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 29 day of October, 2015 before me, the undersigned officer, personally appeared Roger D. Mohr, as Trustee under the Roger D. Mohr Living Trust, dated July 8, 2010, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.



Maynard Heuer
Notary Public for State of South Dakota
My commission expires: 7-15-2021

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

The Northeast Quarter (NE1/4) of Section Eleven (11), Township One Hundred Eighteen (118) North, Range Fifty-Two (52) West of the 5th P.M., less that portion of said Northeast Quarter lying South and East of the railroad right of way, less railroad right of way and less Outlot 1, Codington County, South Dakota

Parcel number: a portion of 14000001101180521100000 (67 acres)

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201601196 Pages: 6
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 5762

3/28/2016 11:29:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on March 3, 2016, by and between Randy Sieh, a single / married person (collectively or individually, the "**Landowner**"), whose address is 44490 Kline Ave., Florence, SD 57235, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed

unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 10th day of March, 2016 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

Ann Leigh Watts
Notary Public

ANN LEIGH WATTS
Notary Public - Reg. # 7615616
Commonwealth of Virginia
My Commission Expires Mar. 31, 2018

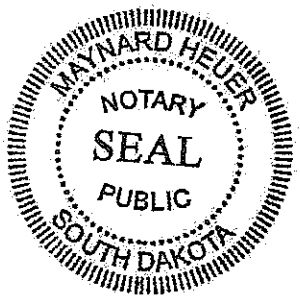
LANDOWNER:

By: Randy Sieh
Name: Randy Sieh

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 3 day of March, 2016, before me, the undersigned officer, personally appeared Randy Sieh, a single / ~~married~~ person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.



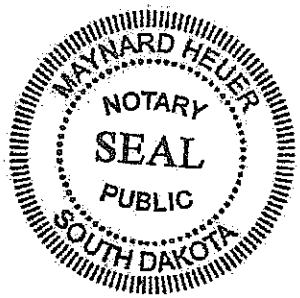
Maynard Heuer
Notary Public for State of South Dakota
My commission expires: 7-15-2021

By: Patricia Sieh
Name: Patricia Sieh

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 3 day of March, 2016 before me, the undersigned officer, personally appeared Patricia Sieh, a ~~married~~ person/a single person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.



Maynard Heuer
Notary Public for State of South Dakota
My commission expires: 7-15-2021

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

Lot 1 and the East Half of the Northwest Quarter, the Southwest Quarter of the Northwest Quarter, and the Northeast Quarter less the South 775 Feet of the North 1245 Feet of the East 618 Feet of said Northeast Quarter (containing 11.0 acres), and less the South 735 Feet of said Northeast Quarter, and less the North 350 Feet of the South 1085 Feet of the East 2174 Feet of said Northeast Quarter, and less the South 735 Feet of the East 1037 Feet of the East Half of the Northwest Quarter (containing 79.6 acres), all in Section 9, Township 119, Range 52 West of the 5th P.M., Codington County, South Dakota, subject to highway right of way, visible or recorded easements and reservations of record, if any.

Parcel numbers: 05000000901190522100000 (132.06 acres)
05000000901190522200000 (85.47 acres)

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201602323 Pages: 6
BOOK: 4T EASEMENT
PAGE: 5903

6/6/2016 11:33:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on 5-5, 2016 by and between Kathleen Neugebauer, a single/ married person (collectively or individually, the "**Landowner**"), whose address is 131 17th St NE, Watertown, SD 57201, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. Lease of Property; Easements. Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed

unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 17th day of May, 2016 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

Jennifer R. Connor
Notary Public

JENNIFER REGINA CONNOR
NOTARY REGISTRATION NO. 7543896
NOTARY PUBLIC
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: MAY 31, 2017

LANDOWNER:

By: Kathleen D Neugebauer
Name: Kathleen Neugebauer

STATE OF South Dakota)
) ss.
COUNTY OF Coding ton)

On this 5 day of May, 2016, before me, the undersigned officer, personally appeared Kathleen Neugebauer, a married person/a single person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.



Notary Public for South Dakota
My commission expires: 4-8-22

By: _____
Name:

STATE OF _____)
) ss.
COUNTY OF _____)

On this ____ day of _____, 201__, before me, the undersigned officer, personally appeared _____, a married person/a single person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

_____
Notary Public for _____
My commission expires: _____

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

Gov't Lot 1, and the Northeast Quarter of the Northwest Quarter(NE1/4NW1/4), and the West 58 Rods of the Northwest Quarter of the Northeast Quarter(NW1/4NE1/4), Section 19, Township 119 North, Range 51 West of the 5th P.M., Codington County, South Dakota

PREPARED BY,
AND AFTER RECORDING,
RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201602324 Pages: 6
BOOK: 4T EASEMENT
PAGE: 5904

6/6/2016 11:34:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on 5-5, 2016 by and between Tim V. Kannas, a single / married person (collectively or individually, the "**Landowner**"), whose address is 45780 160th St, Watertown, SD 57201, and **DAKOTA RANGE I, LLC**, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and

decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member
By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 16th day of May, 2016 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

_____
Notary Public

JENNIFER REGINA CONNOR
NOTARY REGISTRATION NO. 7543896
NOTARY PUBLIC
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: MAY 31, 2017

LANDOWNER:

By: Tim V Kannas
Name: Tim V. Kannas

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 5 day of May, 2016 before me, the undersigned officer, personally appeared Tim V. Kannas, a married person/a single person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.



Notary Public for South Dakota
My commission expires: 4-5-2022

By: _____
Name:

STATE OF _____)
) ss.
COUNTY OF _____)

On this ____ day of _____, 201_, before me, the undersigned officer, personally appeared _____, a married person/a single person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

_____
Notary Public for _____
My commission expires: _____

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

Tract 1:

The Southeast Quarter(SE1/4), less H-1 and less Tim Kannas Addition, Section 34, Township 119 North, Range 52 West of the 5th P.M., Codington County, South Dakota

Tract 2:

The Southwest Quarter(SW1/4) of Section 35, Township 119 North, Range 52 West of the 5th P.M. Codington County, South Dakota

Tract 3:

Gov't Lot 2 and the Southwest Quarter of the Northeast Quarter(SW1/4NE1/4), less Lot H-1, all in Section 3, Township 118 North, Range 52 West of the 5th P.M., Codington County, South Dakota

Tract 4:

The East Half of the Northeast Quarter(E1/2NE1/4), also described as: Gov't Lot 1 and SE1/4NE1/4, all in Section 3, Township 118 North, Range 52 West of the 5th P.M., Codington County, South Dakota

Tract 5:

The North Half of the Southeast Quarter of Section 35, in Township 119 North, Range 52, West of the 5th P.M., subject to public right of way.

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201602883 Pages: 6
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 5969

7/11/2016 10:20:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on 5-19, 2016, by and between Darlis J. Bunde, a married person (collectively or individually, the "**Landowner**"), whose address is 45444 160th St. Watertown, South Dakota 57201, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed

unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 1st day of June, 2016 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

_____
Notary Public

JENNIFER REGINA CONNOR
NOTARY REGISTRATION NO. 7543896
NOTARY PUBLIC
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: MAY 31, 2017

LANDOWNER:

By: Darlis J Bunde
Name: Darlis J. Bunde

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 19 day of MAY, 2016, before me, the undersigned officer, personally appeared Darlis J. Bunde, a married person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

DAVID LAU
SEAL NOTARY PUBLIC SOUTH DAKOTA SEAL

Notary Public for South Dakota
My commission expires: 4-8-22

By: Merlin Bunde
Name: Merlin Bunde

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 19 day of MAY, 2016, before me, the undersigned officer, personally appeared Merlin Bunde, a married person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

DAVID LAU
SEAL NOTARY PUBLIC SOUTH DAKOTA SEAL

Notary Public for South Dakota
My commission expires: 4-8-22

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

Tract 1:

The Southwest Quarter, less Lot H-1, of Section 34, Township 119 North, of Range 52, West of the 5th P.M.;

The West Half of the Northwest Quarter of Section 34, Township 119 North, of Range 52, West of the 5th P.M.;

Parcel number: 05000003401190522200000 (212.67 acres)

Tract 2:

The South Half of the Northwest Quarter and Lots 3 and 4, of Section 3, Township 118 North, of Range 52, West of the 5th P.M., less Lot H-1

Parcel number: 14000000301180522100000 (153.89 acres)

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201602884 Pages: 6
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 5970

7/11/2016 10:21:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on 5-19, 2016, by and between Merlin E. Bunde, a married person (collectively or individually, the "**Landowner**"), whose address is 45444 160th St., Watertown, South Dakota 57201, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed

unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 1st day of June, 2016 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

_____
Notary Public

JENNIFER REGINA CONNOR
NOTARY REGISTRATION NO. 7543896
NOTARY PUBLIC
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: MAY 31, 2017

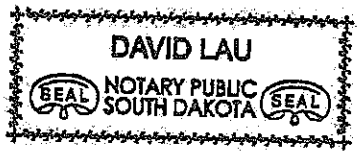
LANDOWNER:

By: Merlin E Bunde
Name: Merlin E. Bunde

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 19 day of MAY, 2016, before me, the undersigned officer, personally appeared Merlin E. Bunde, a married person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.



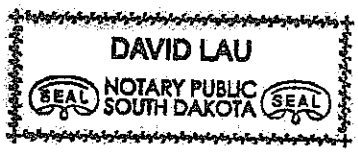
David Lau
Notary Public for South Dakota
My commission expires: 4-8-16

By: Darlis J. Bunde
Name: Darlis J. Bunde, spouse of Merline E. Bunde

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 19 day of MAY, 2016 before me, the undersigned officer, personally appeared Darlis J. Bunde, a married person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.



David Lau
Notary Public for South Dakota
My commission expires: 4-8-16

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

Lots Number Three (3) and Four (4), and the East Half (E½) of the Southeast Quarter (SE¼) of Section 31, in Township 119 North, of Range 52 West of the Fifth P.M.

Parcel Number: 05000003101190524100000 (158.79 acres)

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201602885 Pages: 6
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 5971

7/11/2016 10:22:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on 5-19, 2016, by and between Larin L. Bunde (collectively or individually, the "**Landowner**"), whose address is 45548 160th St., Watertown, South Dakota 57201 and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed

unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 1st day of June, 2016 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

_____
Notary Public

JENNIFER REGINA CONNOR
NOTARY REGISTRATION NO. 7543896
NOTARY PUBLIC
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: MAY 31, 2017

LANDOWNER:

By: Larin L Bunde
Name: Larin L. Bunde

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 19 day of May, 2016, before me, the undersigned officer, personally appeared Larin L. Bunde, a single person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

DAVID LAU
SEAL NOTARY PUBLIC SOUTH DAKOTA SEAL

David Lau
Notary Public for South Dakota
My commission expires: 4-8-22

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

The South Half of Section 32, in Township 119, North of Range 52, West of the 5th P.M., less road, and subject to visible or recorded easements.

Parcel Number: 05000003201190523100000 (319.15 acres)

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201602886 Pages: 6
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 5972

7/11/2016 10:23:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on 5-19, 2016 by and between Edgar O. Bunde, as Trustee of the Edgar O. Bunde Trust, created by Declaration of Trust dated November 19, 1999 (collectively or individually, the "**Landowner**"), whose address is 200 S. Maple, Apt. 104, Watertown, SD 57201, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be

binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 1st day of June, 2016 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

_____
Notary Public

JEANINE G. WOLANSKI
Notary Public - Reg. # 7066537
Commonwealth of Virginia
My Commission Expires Sep. 30, 2018

LANDOWNER:

The Edgar O. Bunde Trust, created by Declaration of Trust dated November 19, 1999

By: Edgar O Bunde
Name: Edgar O. Bunde, as Trustee

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 19 day of MAY, 2016, before me, the undersigned officer, personally appeared Edgar O. Bunde, as Trustee of the Edgar O. Bunde Trust, created by Declaration of Trust dated November 19, 1999, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

DAVID LAU
SEAL NOTARY PUBLIC SOUTH DAKOTA SEAL

David Lau
Notary Public for South Dakota
My commission expires: 4-8-22

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

The Northeast Quarter of Section 4, in Township 118 North of Range 52 West of the 5th P.M.

Parcel number: 14000000401180521100000 (159.90 acres)

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201700893 Pages: 6
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 6341

3/6/2017 12:30:00 PM
Ann Rasmussen
ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA
Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on 7-13, 2016, by and between Jackie L. Zubke and Grace M. Zubke (collectively or individually, the "**Landowner**"), whose address is 45785 159th St., Watertown, SD 57201, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed

unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Gordon J. Trousdale
Title: CFO

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 21st day of July, 2016 by Gordon J. Trousdale as the Chief Financial Officer for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

_____
Notary Public

JENNIFER REGINA CONNOR
NOTARY REGISTRATION NO. 7543896
NOTARY PUBLIC
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: MAY 31, 2017

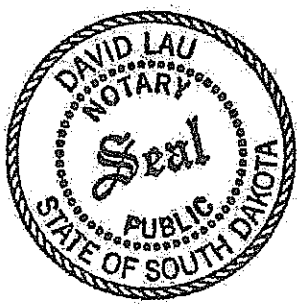
LANDOWNER:

By: Jackie L Zubke
Name: Jackie L. Zubke

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 13 day of July, 2016, before me, the undersigned officer, personally appeared Jackie L. Zubke, a married person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.



David Lau
Notary Public South Dakota
(State)
My commission expires: 4-8-22

By: Grace M Zubke
Name: Grace M. Zubke

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 13 day of July, 2016, before me, the undersigned officer, personally appeared Grace M. Zubke, a married person, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.



David Lau
Notary Public South Dakota
(State)
My commission expires: 4-8-22

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

The East Half of the Northwest Quarter of Section 34, Township 119 North, Range 52, West of the 5th P.M., subject to highway rights of way, visible or recorded easements, and reservations of record, if any.

Parcel number: 05000003401190521100000 (74 acres out of a 220 acre tract)

Filed in - Grant County, Milbank, SD
Recorded on 2/17/2017 2:00 PM
Transaction # 1007231
Document # 232592
Book 283
Page 742 (7 pages) Rec. Fee $30.00
Nancy Copeland
Nancy Copeland, Register of Deeds
Return To:
APEX CLEAN ENERGY
236 EAST HIGH STREET
CHARLOTTESVILLE, VA 22902

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on 4-24, 2016, by and between Falk Farms, Inc. (collectively or individually, the "**Landowner**"), whose address is 45268 155th St., South Shore, SD 57263, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Grant County and Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed

unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law**. This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 10th day of October, 2016 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

Jennifer R. Connor
Notary Public

JENNIFER REGINA CONNOR
NOTARY REGISTRATION NO. 7543896
NOTARY PUBLIC
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: MAY 31, 2017

LANDOWNER:

Falk Farms, Inc.

By: Warren Falk
Name: Warren Falk
Title: President

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 24 day of September, 2015, before me, the undersigned officer, personally appeared Warren Falk, President of Falk Farms, Inc., known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

DAVID LAU NOTARY Seal PUBLIC STATE OF SOUTH DAKOTA

Notary Public South Dakota
(State)
My commission expires: 4-8-22

EXHIBIT "A"

Description of Property

All that real property located in Grant County and Codington County, South Dakota, described as follows:

Tract 1:

The Southwest Quarter (SW1/4) of Section Twenty-four (24), Township One Hundred Twenty (120) North, Range Fifty-two (52) West of the Fifth P.M., in Sisseton and Wahpeton Indian Reservation, in Grant County, South Dakota

Parcel Number: 09.52.24.3000 (160 acres)

Tract 2:

The South Half of Section 22, Township 120 North, Range 52 West of the 5th P.M., in the former Sisseton and Wahpeton Indian Reservation.

Parcel Numbers: 09.52.22.3000 (160 acres)
09.52.22.4000 (160 acres)

Tract 3:

The Southeast Quarter of Section 15, Township 120 North, Range 52 West of the 5th P.M., in the former Sisseton and Wahpeton Indian Reservation.

Parcel Number: 09.52.15.4000 (160 acres)

Tract 4:

The Northeast Quarter of Section 15, Township 120 North, Range 52 West of the 5th P.M., in the former Sisseton and Wahpeton Indian Reservation.

Parcel Number: 09.52.15.1000 (160 acres)

Tract 5:

The West Half of Section 23, Township 120 North, Range 52 West of the 5th P.M., in the former Sisseton and Wahpeton Indian Reservation.

Parcel Numbers: 09.52.23.2000 (160 acres)
09.52.23.3000 (160 acres)

Tract 6:

Northeast Quarter less the North 575 Feet less South 187 Feet of East 400 Feet thereof and less South 272 Feet of North 660 Feet of East 400 Feet and less right of way, in Section 25, Township 120 North, Range 52 West of the 5th P.M., in the Sisseton and Wahpeton Indian Reservation.

Parcel Number: 050000025012052R1200000 (123.61 acres)

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201700891 Pages: 6
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 6339

3/6/2017 12:28:00 PM
Ann Rasmussen
ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA
Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on November 11, 2016 by and between Alice I. Moyer, a single person (collectively or individually, the "**Landowner**"), whose address is 2020 13th Ave. Circle NE, Watertown, SD 57201 and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed

unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Jeanine G. Wolanski
Title: Vice President of Land Management

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 16th day of November, 2016 by Jeanine G. Wolanski as the Vice President of Land Management for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

_____
Notary Public

JENNIFER REGINA CONNOR
NOTARY REGISTRATION NO. 7543896
NOTARY PUBLIC
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: MAY 31, 2017

LANDOWNER:

By: Alice Moyer
Name: Alice I Moyer

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 7 day of November, 2016, before me, the undersigned officer, personally appeared Alice I Moyer, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

DAVID LAU
SEAL NOTARY PUBLIC SOUTH DAKOTA SEAL

Notary Public 4-8-22
My commission expires: South Dakota
(State)

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

the North Half of the Southwest Quarter of Section 10, in Township 119 North, of Range 52 West of the 5th P.M. (less Lot H-1).

Parcel number: 05000001001190523100000 (74.35 acres)

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201700888 Pages: 6
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 6336

3/6/2017 12:25:00 PM
Ann Rasmussen
ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA
Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on December 8, 2016, by and between Roger D. Mohr, as trustee under the Roger D. Mohr Living Trust, dated July 8, 2010 (collectively or individually, the "**Landowner**"), whose address is 16146 459th Ave., Watertown, SD. 57201, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and

decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: Jeanine G. Wolanski
Name: Jeanine G. Wolanski
Title: VP of Land Management

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 20th day of December, 2016 by Jeanine G. Wolanski as the VP of Land Management for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

Jennifer R. Connor
Notary Public

JENNIFER REGINA CONNOR
NOTARY REGISTRATION NO. 7543896
NOTARY PUBLIC
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: MAY 31, 2017

LANDOWNER:

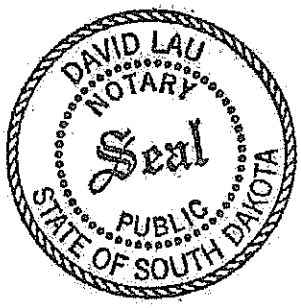
By: Roger D Mohr

Name: Roger D. Mohr, as Trustee under the Roger D. Mohr Living Trust, dated July 8, 2010

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 8 day of December, 2016, before me, the undersigned officer, personally appeared Roger D. Mohr, as Trustee under the Roger D. Mohr Living Trust, dated July 8, 2010, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.



Notary Public South Dakota
(State)
My commission expires: 4-8-22

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

Tract 1:

The Southwest Quarter (SW1/4) of Section 11, Township 118 North, Range 52 West of the 5th P.M., less railroad right of way, Codington County, South Dakota;

Parcel Number: 14000001101180523100000 (157.19 acres)

Tract 2:

The Northeast Quarter (NE1/4) of Section Eleven (11), Township One Hundred Eighteen (118) North, Range Fifty-Two (52) West of the 5th P.M., less that portion of said Northeast Quarter lying North and West of the railroad right of way, less railroad right of way and less Outlot 1, Codington County, South Dakota

Parcel Number: a portion of 14000001101180521100000 (86.12 acres)

Tract 3:

The Southeast Quarter (SE1/4) of Section Eleven (11), Township One Hundred Eighteen (118) North, Range Fifty-Two (52), West of the 5th P.M., Codington County, South Dakota.

Parcel Number: 14000001101180524100000 (160 acres)

Tract 4:

The Northeast Quarter (NE1/4) of Section Twelve (12), Township One Hundred Eighteen (118) North, Range Fifty-Two (52), West of the 5th P.M., Codington County, South Dakota.

Parcel Number: 14000001201180521100000 (160 acres)

Tracts 5 and 6:

The Northwest Quarter (NW1/4) of Section Twelve (12), Township One Hundred Eighteen (118) North, Range Fifty-Two (52), West of the 5th P.M., less that portion of said Northwest Quarter lying North and West of the railroad right of way, less railroad right of way and less highway right of way, Codington County, South Dakota.

Parcel Numbers: 14000001201180522000000 (2.96 acres)
14000001201180522100000 (152.50 acres)

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201700890 Pages: 6
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 6338

3/6/2017 12:27:00 PM
Ann Rasmussen
ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA
Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on December 20, 2016, by and between Tony Breske and Gwen Breske, husband and wife (collectively or individually, the "**Landowner**"), whose address is 45978 161st St., Watertown, SD 57201, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. Lease of Property; Easements. Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to

which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: Jeanine G Wolanski
Name: Jeanine G. Wolanski
Title: Vice President of Land Management

COMMONWEALTH OF VIRGINIA)
) ss.
CITY OF CHARLOTTESVILLE)

The foregoing instrument was acknowledged before me this 6th day of January, 2017 by Jeanine G. Wolanski, Vice President of Land Management for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

Jennifer R. Connor
Notary Public

JENNIFER REGINA CONNOR
NOTARY REGISTRATION NO. 7543896
NOTARY PUBLIC
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: MAY 31, 2017

LANDOWNER:

By: Tony Breske
Name: Tony Breske

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 20 day of December, 2016 before me, the undersigned officer, personally appeared Tony Breske, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

DAVID LAU
NOTARY PUBLIC
SOUTH DAKOTA
SEAL SEAL

Notary Public South Dakota
(State)
My commission expires: 4-8-22

By: Gwen Breske
Name: Gwen Breske

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 20 day of December, 2016 before me, the undersigned officer, personally appeared Gwen Breske, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

DAVID LAU
NOTARY PUBLIC
SOUTH DAKOTA
SEAL SEAL

Notary Public South Dakota
(State)
My commission expires: 4-8-22

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

All that portion of the East 1213.7 Feet of the Southeast Quarter of Section 1, Township 118 North, Range 52 West of the 5th P.M., Codington County, South Dakota, lying South and West of the plat entitled: "Thrun Addition in the SE¼ of Section 1, T116N, R52W of the 5th P.M., Codington County, South Dakota", subject to public right of way.

Parcel number: 1448850010118052440000 (33.34 acres)

Filed in - Grant County, Milbank, SD
Recorded on 3/7/2017 11:20 AM
Transaction # 1007336
Document # 232697
Book 283
Page 955 (7 pages) Rec. Fee $30.00
Nancy Copeland
Nancy Copeland, Register of Deeds
Return To:
APEX CLEAN ENERGY
310 4TH STREET NE - STE 200
CHARLOTTESVILLE, VA 22902

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on January 17, 2017, by and between Dennis H. Heuer, a/k/a Dennis Heuer and Sally J. Heuer, a/k/a Sally Heuer, husband and wife; and Brian D. Heuer, a/k/a Brian Heuer and Noelle Heuer, husband and wife (collectively or individually, the "**Landowner**"), whose address is 1330 N. Broadway, Watertown, SD 57201, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County and Grant County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be

binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: Jeanine G Wolanski
Name: Jeanine G. Wolanski
Title: Vice President of Land Management

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 26th day of January, 2017 by Jeanine G. Wolanski as the Vice President of Land Management for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

THERESA ANNE HARRIOTT
NOTARY PUBLIC
REG.# 7639868
COMMISSION EXPIRES 1/31/2019
COMMONWEALTH OF VIRGINIA

Theresa Anne Harriott
Notary Public

LANDOWNER:

By: Dennis Heuer
Name: Dennis H. Heuer, a/k/a Dennis Heuer

STATE OF South Dakota)
) ss.
COUNTY OF Grant)

On this 17 day of January, 2017, before me, the undersigned officer, personally appeared Dennis H. Heuer, a/k/a Dennis Heuer, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

DAVID LAU NOTARY Seal PUBLIC STATE OF SOUTH DAKOTA

Notary Public South Dakota
(State)
My commission expires: 4-8-22

By: Sally J. Heuer
Name: Sally J. Heuer, a/k/a Sally Heuer

STATE OF South Dakota)
) ss.
COUNTY OF Grant)

On this 17 day of January, 2017, before me, the undersigned officer, personally appeared Sally J. Heuer, a/k/a Sally Heuer, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

DAVID LAU NOTARY Seal PUBLIC STATE OF SOUTH DAKOTA

Notary Public South Dakota
(State)
My commission expires: 4-8-22

By: _____
Name: Brian D. Heuer, a/k/a Brian Heuer

STATE OF South Dakota)
) ss.
COUNTY OF Grant)

On this 17 day of January, 2017 before me, the undersigned officer, personally appeared Brian D. Heuer, a/k/a Brian Heuer, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

DAVID LAU NOTARY Seal PUBLIC STATE OF SOUTH DAKOTA

_____
Notary Public South Dakota
(State)
My commission expires: 4-8-22

By: _____
Name: Noelle Heuer

STATE OF South Dakota)
) ss.
COUNTY OF Grant)

On this 17 day of January, 2017 before me, the undersigned officer, personally appeared Noelle Heuer, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

DAVID LAU NOTARY Seal PUBLIC STATE OF SOUTH DAKOTA

_____
Notary Public South Dakota
(State)
My commission expires: 4-8-22

EXHIBIT "A"

Description of Property

All that real property located in Codington County and Grant County, South Dakota, described as follows:

Tract 1:

The South 735 Feet of the East 1037 Feet of the East Half of the Northwest Quarter (E1/2NW1/4) of Section 9, Township 119 North, Range 52 West of the 5th P.M., Codington County, South Dakota

Parcel number: 05000000901190521100000 (17.50 acres)

Tract 2:

The South 735 Feet of the Northeast Quarter (NE1/4) AND the North 350 Feet of the South 1085 Feet of the East 2174 Feet of the Northeast Quarter (NE1/4) all in Section 9, Township 119 North, Range 52 West of the 5th P.M., Codington County, South Dakota.

Parcel number: 05000000901190522300000 (62.00 acres)

Tract 3:

The South 29.2 rods of the East 54.4 rods of the Southeast Quarter (SE1/4) of Section 14, Township 120 North, Range 52 West of the 5th P.M., in the former Sisseton and Wahpeton Indian Reservation, Grant County, South Dakota

Parcel number: 09.52.14.4000 (10.00 acres)

Tract 4:

The Northeast Quarter (NE1/4) of Section 23, Township 120 North, Range 52 West of the 5th P.M., in the former Sisseton and Wahpeton Indian Reservation, Grant County, South Dakota.

Parcel number: 09.52.23.1000 (160.00 acres)

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on February 18, 2017, by and between Allen C. Amdahl, a single person (collectively or individually, the "**Landowner**"), whose address is P.O. Box 704, Summit, SD 57266, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Grant County and Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the **"Development Period"**). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the **"First Renewal Term"**). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the **"Second Renewal Term"**). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed

unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: Jeanine G. Wolanski
Name: Jeanine G. Wolanski
Title: Vice President of Land Management

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 3 day of March, 2017 by Jeanine G. Wolanski as the Vice President of Land Management for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

WILLIAM HARRISON PARKER
NOTARY PUBLIC
REGISTRATION # 7715957
COMMONWEALTH OF VIRGINIA

William Harrison Parker
Notary Public

LANDOWNER:

By: Allen C Amdahl
Name: Allen C. Amdahl

STATE OF South Dakota)
) ss.
COUNTY OF Roberts)

On this 15 day of February, 201_, before me, the undersigned officer, personally appeared Allen C. Amdahl, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.



David Lau
Notary Public South Dakota
(State)
My commission expires: 4-8-22

EXHIBIT "A"

Description of Property

All that real property located in Grant County, South Dakota, described as follows:

Tracts 1 and 2:

LOT THREE (3), FRANK AND BRENDA REDLIN SUBDIVISION IN THE NORTHEAST QUARTER (NE¼),

AND

NW1/4, ALSO DESCRIBED AS GOVERNMENT LOTS 1 AND 2 AND THE E1/2NW1/4, AND THE NORTH 1,640 FEET OF THE NE1/4, ALSO DESCRIBED AS THE NORTH 100 ACRES OF THE NE1/4, ALL IN SECTION THIRTY-ONE (31), TOWNSHIP ONE HUNDRED TWENTY-ONE (121) NORTH, RANGE FIFTY-ONE (51) WEST OF THE 5TH P.M, IN THE FORMER SISSETON AND WAHPETON INDIAN RESERVATION, GRANT COUNTY, SOUTH DAKOTA, SUBJECT TO EASEMENTS AND RESERVATIONS OF RECORD OR VISIBLE UPON THE PROPERTY.

Parcel Numbers: 05.51.31.1100 (140.51 acres)
05.51.31.2000 (158.77 acres)

Tract 3:

The Southwest Quarter of Section 26, Township 121 North, of Range 52, West of the 5th P.M., in the Sisseton-Wahpeton Indian Reservation.

Less and Except:

Lot 1, Allen Amdahl Subdivision, located in the Southwest Quarter of Section 26, Township 121 North, Range 52 West of the 5th P.M., in the former Sisseton-Wahpeton Indian Reservation, according to the recorded plat thereof.

Parcel Number: 04.52.26.3000 (149.53 acres)

Tracts 4 and 5:

THE NORTH HALF (N 1/2) OF SECTION THIRTY-FOUR (34), TOWNSHIP ONE HUNDRED TWENTY-ONE (121) NORTH OF RANGE FIFTY-TWO (52) WEST OF THE FIFTH PRINCIPAL MERIDIAN, IN THE SISSETON & WAHPETON INDIAN RESERVATION, GRANT COUNTY, SOUTH DAKOTA.

Parcel Numbers: 04.52.34.1000 (160 acres)
04.52.34.2000 (160 acres)

Tract 6:

The North Half of the Northwest Quarter of Section 35, Township 121 North, of Range 52, West of the 5th P.M., in the Sisseton-Wahpeton Indian Reservation.

Parcel Number: 04.52.35.2000 (80 acres)

All that real property located in Codington County, South Dakota, described as follows:

Tract 7:

The Southeast Quarter of Section 36, Township 120 North, Range 52 West of the 5th P.M., in the former Sisseton and Wahpeton Indian Reservation, subject to public right of way.

Less and Except:

A tract of land to be acquired for highway purposes in the SE¼ of Section 36----Township 120 North----Range 52 West (Reservation) of the Fifth P.M. for the construction of BRF 6127(3)

Parcel Number: 050000036012052R4100000 (158.90 acres)

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on March 14, 2017, by and between Tyler Grabow, a/k/a Tyler L. Grabow, and Hilary Grabow, husband and wife (collectively or individually, the "**Landowner**"), whose address is 47286 145th St., Twin Brooks, SD 57269, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Grant County and Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to

which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: Jeanine G. Wolanski
Name: Jeanine G. Wolanski
Title: Vice President of Land Management

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 13th day of April, 2017 by Jeanine G. Wolanski as the Vice President of Land Management for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

Jennifer R. Connor
Notary Public

JENNIFER REGINA CONNOR
NOTARY REGISTRATION NO. 7543896
NOTARY PUBLIC
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: MAY 31, 2017

LANDOWNER:

By: Tyler Grabow
Name: Tyler Grabow, a/k/a Tyler L. Grabow

STATE OF South Dakota)
) ss.
COUNTY OF Grant)

On this 14th day of March, 2017 before me, the undersigned officer, personally appeared Tyler Grabow, a/k/a Tyler L. Grabow, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

Patrick N. Adams
Notary Public South Dakota
(State)
My commission expires: May 24, 2022

PATRICK N. ADAMS
SEAL NOTARY PUBLIC SOUTH DAKOTA SEAL

By: Hilary Grabow
Name: Hilary Grabow

STATE OF South Dakota)
) ss.
COUNTY OF Grant)

On this 14th day of March, 2017, before me, the undersigned officer, personally appeared Hilary Grabow, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

Patrick N. Adams
Notary Public South Dakota
(State)
My commission expires: May 24, 2022

PATRICK N. ADAMS
SEAL NOTARY PUBLIC SOUTH DAKOTA SEAL

EXHIBIT "A"

Description of Property

All that real property located in Grant County, South Dakota, described as follows:

Tract 1:

THE NORTH HALF OF THE SOUTHWEST QUARTER OF SECTION 20, TOWNSHIP 120 NORTH, RANGE 51 WEST OF THE 5TH P.M., GRANT COUNTY, SOUTH DAKOTA, SUBJECT TO EASEMENTS AND RESERVATIONS OF TITLE OF RECORD, AND SUBJECT TO ANY STATE OF FACTS AN ACCURATE SURVEY WOULD SHOW.

Parcel Number: 11.51.20.3000 (80 acres)

Tract 2:

THE SOUTH HALF OF THE SOUTHWEST QUARTER OF SECTION 20, TOWNSHIP 120 NORTH, RANGE 51 WEST OF THE 5TH P.M., GRANT COUNTY, SOUTH DAKOTA, SUBJECT TO EASEMENTS AND RESERVATIONS OF TITLE OF RECORD, AND SUBJECT TO ANY STATE OF FACTS AN ACCURATE SURVEY WOULD SHOW.

Parcel Number: 11.51.20.3100 (80 acres)

All that real property located in Codington County, South Dakota, described as follows:

Tract 3:

GOVERNMENT LOTS THREE (3) AND FOUR (4) AND THE SOUTH HALF OF THE NORTHWEST QUARTER (S½NW¼), ALSO DESCRIBED AS THE NORTHWEST QUARTER (NW ¼) OF SECTION ONE, TOWNSHIP ONE HUNDRED NINETEEN (119) NORTH, RANGE FIFTY-TWO (52) WEST OF THE 5TH P.M., CODINGTON COUNTY, SOUTH DAKOTA, SUBJECT TO EASEMENTS AND RESERVATIONS OF RECORD OR VISIBLE UPON THE PROPERTY.

Parcel Number: 05000000101190522100000 (158.59 acres)

Tract 4:

GOVERNMENT LOTS ONE (1) AND TWO (2) AND THE SOUTH HALF OF THE NORTHEAST QUARTER (S½NE¼), ALSO DESCRIBED AS THE NORTHEAST QUARTER (NE ¼) OF SECTION TWO (2), TOWNSHIP ONE HUNDRED NINETEEN (119) NORTH, RANGE FIFTY-TWO (52) WEST OF THE 5TH P.M., CODINGTON COUNTY, SOUTH DAKOTA, SUBJECT TO EASMENTS AND RESERVATIONS OF RECORD OR VISIBLE UPON THE PROPERTY; AND

Less and Except:

Grabow Addition located in Government Lot 1 of the Northeast Quarter (NE1/4) of Section 2, Township 119 North, Range 52 West of the 5th P.M., in the County of Codington, South Dakota, according to the recorded plat thereof.

Parcel Number: 05000000201190521100000 (153.02 acres)

Tract 5:

THE NORTHWEST QUARTER (NW1/4) OF SECTION TWO (2), TOWNSHIP ONE HUNDRED NINETEEN (119) NORTH, RANGE FIFTY-TWO (52) WEST OF THE 5TH P.M., CODINGTON COUNTY, SOUTH DAKOTA, SUBJECT TO EASMENTS AND RESERVATIONS OF RECORD OR VISIBLE UPON THE PROPERTY

Parcel Number: 05000000201190522100000 (158.34 acres)

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on March 28, 2017, by and between Alaine L. Bunde, a/k/a Alaine Bunde, a married person (collectively or individually, the "**Landowner**"), whose address is 45250 159th Street, Florence, SD 57235, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to

which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law**. This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: Jeanine G. Wolanski
Name: Jeanine G. Wolanski
Title: Vice President of Land Management

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 13th day of April, 2017 by Jeanine G. Wolanski as the Vice President of Land Management for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

Jennifer R. Connor
Notary Public

JENNIFER REGINA CONNOR
NOTARY REGISTRATION NO. 7543896
NOTARY PUBLIC
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: MAY 31, 2017

LANDOWNER:

By: Alaine L. Bunde
Name: Alaine L. Bunde, a/k/a Alaine Bunde

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 10 day of March, 2017 before me, the undersigned officer, personally appeared Alaine L. Bunde, a/k/a Alaine Bunde, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

DAVID LAU
SEAL NOTARY PUBLIC SOUTH DAKOTA SEAL

Notary Public South Dakota
(State)
My commission expires: 4-8-22

The undersigned spouse is joining this Agreement to acknowledge and accept its contents and to ratify the Agreement as applicable to his/her interest in the Property.

By: Kenneth Bunde
Name: Kenneth Bunde

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 10 day of March, 2017, before me, the undersigned officer, personally appeared Kenneth Bunde, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

DAVID LAU
SEAL NOTARY PUBLIC SOUTH DAKOTA SEAL

Notary Public South Dakota
(State)
My commission expires: 4-8-22

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

Tract 1:

The South Half of the Southwest Quarter (S1/2SW1/4), less Lot H-1 of Section 10, Township 119 North, Range ~~51~~ 52 West of the 5th P.M.

Parcel number: 05000001001190523300000 (73.98 acres)

Tract 2:

The Northwest Quarter, less H2 & H3, of Section 15, Township 119 North, Range 52 West of the 5th P.M., Codington County, South Dakota

Parcel number: 05000001501190522100000 (145.23 acres)

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on March 28, 2017, by and between Barbara E. Waldron and Debra D. Caulk, Co-Trustees of the Rollo C. Korth Family Trust Under Agreement dated October 12, 2012 (collectively or individually, the "**Landowner**"), whose address is 15821 455th Avenue, Watertown, SD 57201, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to

which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: Jeanine G. Wolanski
Name: Jeanine G. Wolanski
Title: Vice President of Land Management

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 13th day of April, 2017 by Jeanine G. Wolanski as the Vice President of Land Management for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

Jennifer R. Connor
Notary Public

JENNIFER REGINA CONNOR
NOTARY REGISTRATION NO. 7543896
NOTARY PUBLIC
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: MAY 31, 2017

LANDOWNER:

By: Barbara E. Waldron, Co-Trustee
Name: Barbara E. Waldron, Co-Trustee of the Rollo C. Korth Family Trust Under Agreement dated October 12, 2012

STATE OF South Dakota)
) ss.
COUNTY OF Codington)
(Where signed)

On this 16 day of March, in the year 2017, before me, the undersigned officer, personally appeared Barbara Waldron, Co-Trustee of the Rollo C. Korth Family Trust Under Agreement dated October 12, 2012, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

In witness whereof, I hereunto set my hand and official seal.

DAVID LAU NOTARY Seal PUBLIC STATE OF SOUTH DAKOTA

Notary Public South Dakota
(State)
My commission expires: 4-8-22

By: Debra D. Caulk, Co-trustee
Name: Debra D. Caulk, Co-Trustee of the Rollo C. Korth Family Trust Under Agreement dated October 12, 2012

STATE OF Arizona)
) ss.
COUNTY OF Maricopa)
(Where signed)

On this 14 day of March, in the year 2017, before me, the undersigned officer, personally appeared Debra D. Caulk, Co-Trustee of the Rollo C. Korth Family Trust Under Agreement dated October 12, 2012, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

In witness whereof, I hereunto set my hand and official seal.

Notary Public Arizona
(State)
My commission expires: 09/12/2018

ANNA E. DAMIAN
NOTARY PUBLIC - ARIZONA
Maricopa County
My Commission Expires
September 12, 2018

EXHIBIT "A"

Description of Property

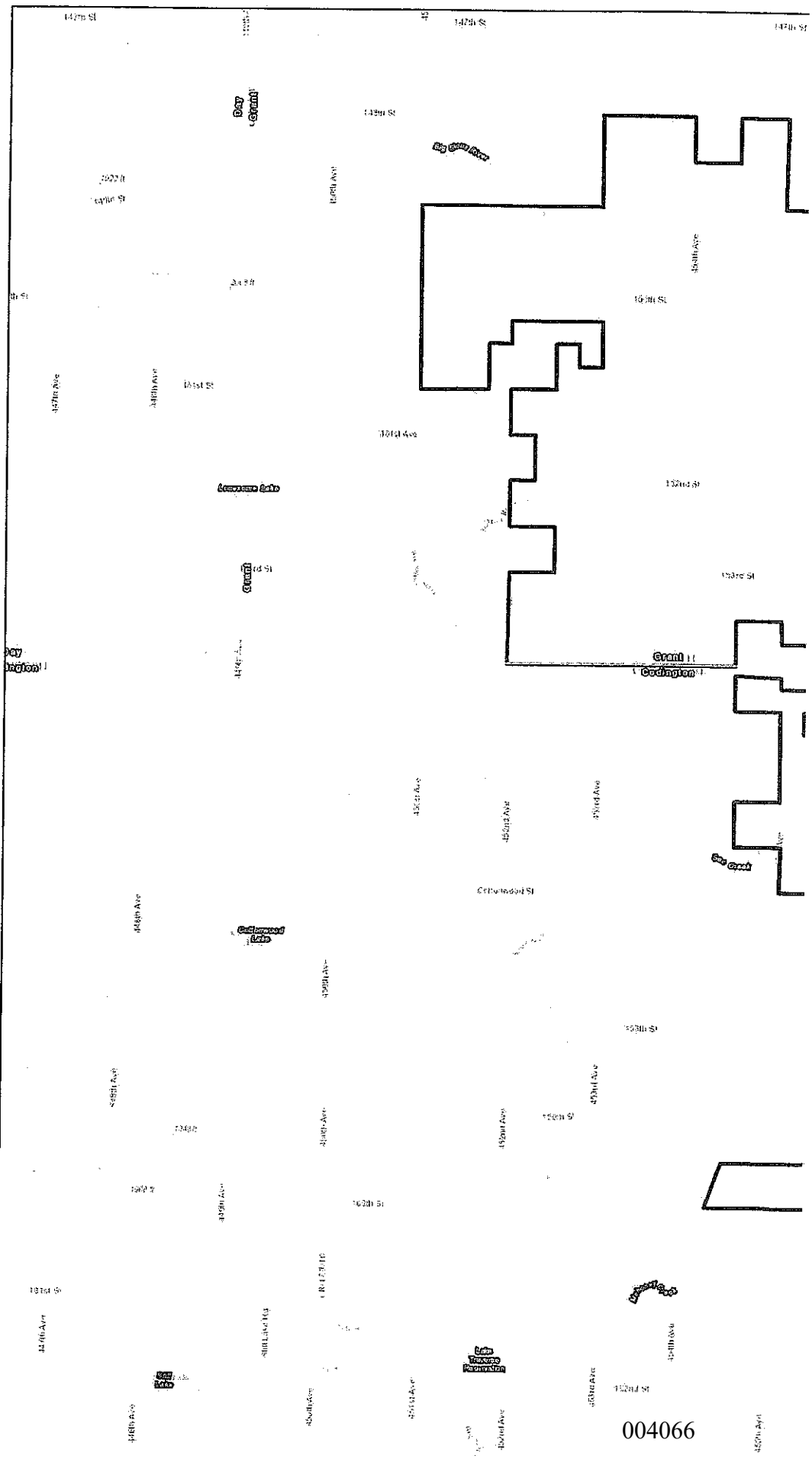
All that real property located in Codington County, South Dakota, described as follows:

The Northeast Quarter, less the South 42 Feet of the North 75 Feet and less highway right of way, including Lots H-2 and H-3, all in Section 22, Township 119 North, Range 52 West of the 5th P.M., subject to visible or recorded easements, restrictions, conditions, covenants or reservations.

Parcel number: 05000002201190521100000 (148.21 acres)

Dakota Range: Project Map

Project Boundary



Date: 4/27/2017 Author: MR CONFIDENTIAL

Coordinate System: NAD 1983 StatePlane South Dakota North FIPS 4001 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US

APEX CLEAN ENERGY

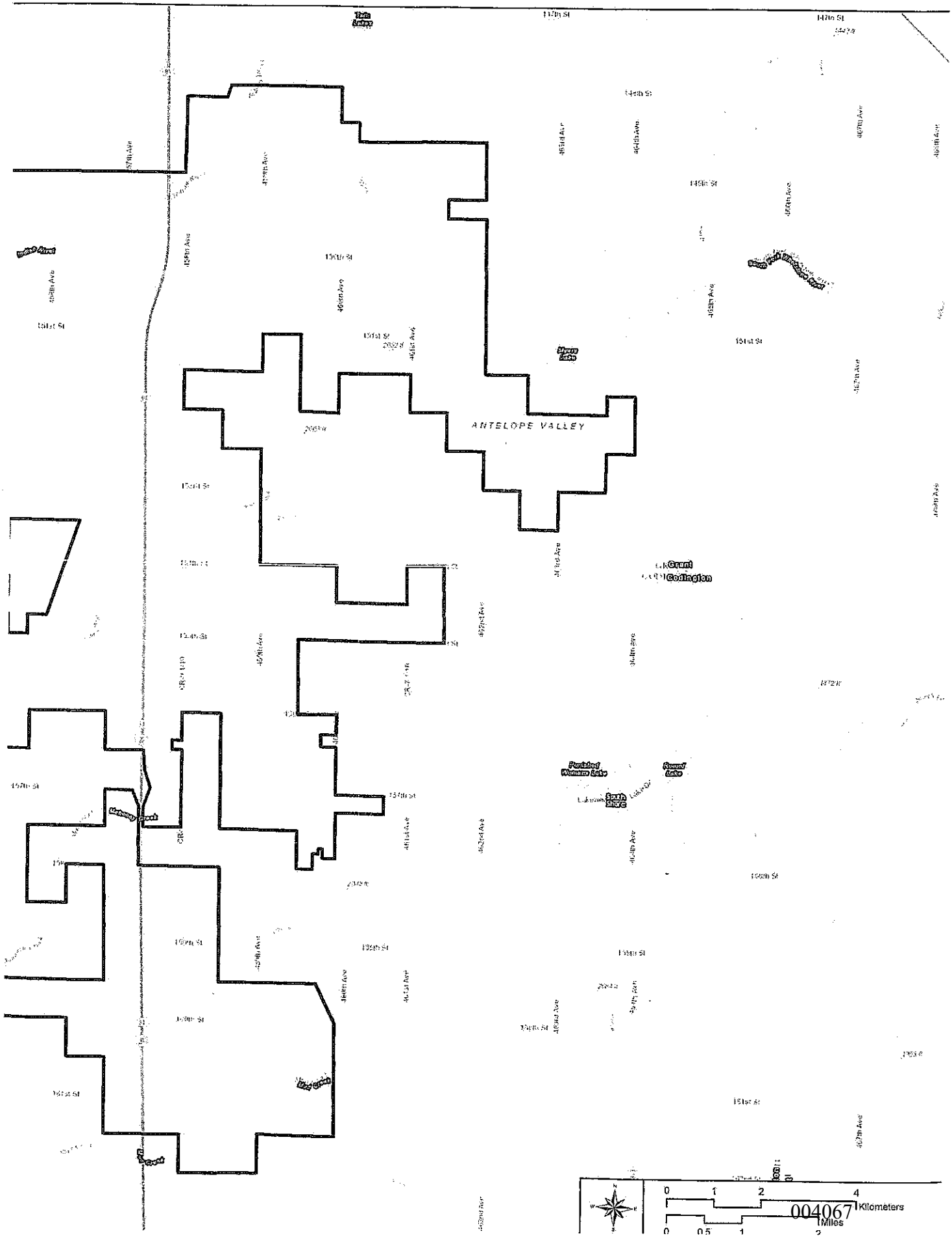

ANTELOPE VALLEY
Grant
Codington
Kilometers
Miles
004067

Exhibit A

Description of the Property

All that real property located in Codington County, South Dakota, described as follows:

The Southwest Quarter of Section 11, Township 119 North, Range 52, West of the 5th P.M., Codington County, South Dakota
(160 acres)

Elaine M. Kleinprintz and Michael E. Kleinprintz

RECORDING REQUESTED BY,
AND AFTER RECORDING,
RETURN TO:
DHan James, Project Administrator
Wahpeton Wind, LLC
200 Royal Oaks Blvd, A3
Franklin, TN 37067
Tele: 615.418.3210

INSTRUMENT NO. 201500921 Pages: 5
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 4925

3/11/2015 4:00:00 PM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: DHAN JAMES PROJECT ADMINISTF

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, **effective on** February 17, 2015, by and between Bret Lagodinski & Kristie Lagodinski (collectively or individually, the "**Landowner**"), whose **address is** 15167 456th Ave. Summit, S.D. 57266 and **WAHPETON WIND ~~FARM~~ JN, LLC,** a Colorado limited liability company ("**Lessee**"), whose address is 125 South Howes Street, Suite 870, Fort Collins, CO 80521, in light of the following facts and circumstances:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on **Exhibit A** attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, **Landowner and Lessee hereby agree** as follows:

1. Lease of Property; Easements. Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate; and

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more turbines on the Property or on other property within the Project, and any such wind turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18)

months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signatures appear on the next Page

IN WITNESS WHEREOF, Landowner and Lessee have caused this Lease Short Form to be executed and delivered by their duly authorized representatives as of the date first written above.

LESSEE: **WAHPETON WIND, LLC,**
a Colorado limited liability company

By: Jim Newcomb
Printed Name: Jim Newcomb

Title: Manager

STATE OF Colorado COUNTY OF Larimer (Where signed)

The foregoing instrument was subscribed and acknowledged before me this 17th day of February, 2015, by Jim Newcomb, a Representative of the Colorado limited liability company, on behalf of the limited liability company.

KATE MILLER
Notary Public
State of Colorado
Notary ID 20014008717
My Commission Expires Mar 20, 2017

Kate Miller
Notary Public for Colorado

My commission expires: 3-20-2017

LANDOWNER:

By: Bret Lagodinski
Printed Name: Bret Lagodinski

By: Kristie Lagodinski
Printed Name: Kristie Lagodinski

STATE OF South Dakota COUNTY OF Roberts (Where signed)

This instrument was subscribed and acknowledged before me on this 13 day of February, 2015, by Bret Lagodinski and Kristie Lagodinski. Earline Holt

EARLINE HOLT
SEAL NOTARY PUBLIC SEAL
SOUTH DAKOTA

Notary Public for South Dakota
My commission Expires: 3-28-2020

Exhibit A

Description of the Property (Bret Lagodinski) and (Kristie Lagodinski)

All that real property located in Codington County, South Dakota, described as follows:

The East One – Half (E1/2) of Section Fifteen (15) in Township One Hundred Nineteen (119) North of Range Fifty – two (52) West of the 5th P.M., less Lot H-1 in the Northeast Quarter (NE1/4) and less Lots H-1, H-2 and H-3 in the Southeast Quarter (SE1/4), however, this contract shall cover any reversionary rights in said highway right – of – ways deeds.
(293 acres)

RECORDING REQUESTED BY,
AND AFTER RECORDING,
RETURN TO:
DHan James, Project Administrator
Wahpeton Wind, LLC
200 Royal Oaks Blvd, A3
Franklin, TN 37067
Tele: 615.418.3210

INSTRUMENT NO. 201500924 Pages: 5
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 4928

3/11/2015 4:03:00 PM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: DHAN JAMES PROJECT ADMINISTF

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, **effective on** March 8, 2015, by and between Gloria Letrud (collectively or individually, the "**Landowner**"), whose **address is** 2318 350th St. Madison, MN. 56256, and **WAHPETON WIND ~~FARM~~ JN, LLC,** a Colorado limited liability company ("**Lessee**"), whose address is 125 South Howes Street, Suite 870, Fort Collins, CO 80521, in light of the following facts and circumstances:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on **Exhibit A** attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, **Landowner and Lessee hereby agree** as follows:

1. Lease of Property; Easements. Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate; and

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. Term. Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the **"Development Period"**). If Lessee or any Assignee or Tenant installs one or more turbines on the Property or on other property within the Project, and any such wind turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the **"First Renewal Term"**). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the **"Second Renewal Term"**). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. Ownership. Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. No Interference. Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. Lessee's Right to Terminate. Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18)

months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signatures appear on the next Page

IN WITNESS WHEREOF, Landowner and Lessee have caused this Lease Short Form to be executed and delivered by their duly authorized representatives as of the date first written above.

LESSEE: **WAHPETON WIND, LLC,**
a Colorado limited liability company

By: Dhan James
Printed Name: DHAN JAMES
Title: Asst. Project Manager

STATE OF Tennessee COUNTY OF Williamson (Where signed)

The foregoing instrument was subscribed and acknowledged before me this 27th day of February, 2015, by DHAN JAMES, a Representative of the Colorado limited liability company, on behalf of the limited liability company.

JEIMY STEFANNY DIAZ
STATE OF TENNESSEE NOTARY PUBLIC
DAVIDSON COUNTY

Jeimy S. Diaz

Notary Public for Davidson County TN
My commission expires: May 13 2016

LANDOWNER:

By: Gloria J. Letrud
Printed Name: Gloria J. Letrud

By: _____
Printed Name: _____

STATE OF South Dakota COUNTY OF Codington (Where signed)

Gloria Letrud

This instrument was subscribed and acknowledged before me on this 8th day of March, 2015, by Kathleen Meyer.

KATHLEEN MEYER SEAL NOTARY PUBLIC SEAL SOUTH DAKOTA

Codington Co.
Notary Public for South Dakota
My commission Expires: 4/22/2015

Exhibit A

Description of the Property

All that real property located in Codington County, South Dakota, described as follows:

The Southeast Quarter of Section 14, Township 119 North, Range 52 West of the 5th P.M., Codington County, South Dakota
(157 acres)

The Northeast Quarter of Section 23, Township 119 North, Range 52 West of the 5th P.M., Codington County, South Dakota
(157 acres)

Gloria Letrud

INSTRUMENT NO. 201504217 Pages: 5
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 5311

9/17/2015 3:41:28 PM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

RECORDING REQUESTED BY,
AND AFTER RECORDING,
RETURN TO:
Wahpeton Wind, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

Prepared By Apex Clean Energy, Inc.

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on March 8th, 2015, by and between Eugene W. Noeldner and Leone A. Noeldner, husband and wife (collectively or individually, the "**Landowner**"), whose **address is** 15629 459th Ave. South Shore S.D. 57263 and **WAHPETON WIND, LLC**, a Colorado limited liability company ("**Lessee**"), whose address is 125 South Howes Street, Suite 870, Fort Collins, CO 80521, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. Lease of Property; Easements. Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its

original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

WAHPETON WIND, LLC,
a Colorado limited liability company

By: Patrick N. Adams
Name: Patrick N Adams
Title: Project Administrator

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

The foregoing instrument was acknowledged before me this 12 day of March, 2015, by Patrick N. Adams, Project Administrator of **Wahpeton Wind, LLC**, a Colorado limited liability company, on its behalf.

Witness my hand and official seal.

CINDY BRUGMAN
NOTARY PUBLIC
SOUTH DAKOTA

Cindy Brugman
Notary Public for Codington Co., S.D.
My commission expires: 4-22-2020

LANDOWNER:

By: Eugene w Noeldner
Printed Name: Eugene w Noeldner

By: Leone A. Noeldner
Printed Name: LEONE A. Noeldner

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 2 day of March, 2015, before me, the undersigned officer, personally appeared Eugene Noeldner + Leone Noeldner, husband and wife ~~a married person/a single person,~~ known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

COREEN C. BRAZIL NOTARY Seal PUBLIC STATE OF SOUTH DAKOTA

Coreen C Brazil
Notary Public for South Dakota
My commission expires: 1-23-2020

"EXHIBIT A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

The Southwest Quarter (SW1/4), Less Lot H-1, of Section Thirteen (13), Township One Hundred Nineteen (119) North of Range Fifty – two (52) West of the Fifth Principal Meridian, Codington County, South Dakota, and subject to easements and reservations of record.
(157 acres)

Northeast Quarter of Section 14, Township 119 North, of Range 52 West of the 5th P.M., Codington County, South Dakota
(160 acres)

Eugene W. Noeldner and Leone A. Noeldner

RECORDING REQUESTED BY,
AND AFTER RECORDING,
RETURN TO:
Wahpeton Wind, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201504218 Pages: 5
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 5312

9/17/2015 3:42:28 PM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

Prepared by Apex Clean Energy, Inc.

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, **effective on** February 27, 2015, by and between Neil Quitsch (collectively or individually, the "**Landowner**"), whose **address is** 3075 Greenview Pky, Sumter, S.C. 29150, and **WAHPETON WIND ~~FARM~~, LLC,** a Colorado limited liability company ("**Lessee**"), whose address is 125 South Howes Street, Suite 870, Fort Collins, CO 80521, in light of the following facts and circumstances:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on **Exhibit A** attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, **Landowner and Lessee hereby agree** as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate; and

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more turbines on the Property or on other property within the Project, and any such wind turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18)

months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signatures appear on the next Page

IN WITNESS WHEREOF, Landowner and Lessee have caused this Lease Short Form to be executed and delivered by their duly authorized representatives as of the date first written above.

LESSEE: **WAHPETON WIND, LLC,**
a Colorado limited liability company

By: Dhan James
Printed Name: Dhan James
Title: Asst. Project Manager

STATE OF Tennessee COUNTY OF Williamson (Where signed)

The foregoing instrument was subscribed and acknowledged before me this 27th day of February, 2015, by DHAN JAMES, a Representative of the Colorado limited liability company, on behalf of the limited liability company.

JEIMY STEFANNY DIAZ
STATE OF TENNESSEE NOTARY PUBLIC
DAVIDSON COUNTY

Jeimy S. Diaz

Notary Public for Davidson County TN
My commission expires: May 13 2016

LANDOWNER:

By: Neil Quitsch
Printed Name: Neil Quitsch

By: _____
Printed Name: _____

STATE OF South Carolina COUNTY OF Sumter (Where signed)

This instrument was subscribed and acknowledged before me on this 17 day of February, 2015, by Neil Quitsch Brennen Edwards.

BRENNEN EDWARDS
NOTARY PUBLIC
SOUTH CAROLINA

Notary Public for South Carolina
My commission Expires: January 13, 2021

Exhibit A

Description of the Property

All that real property located in Codington County, South Dakota, described as follows:

The Northeast Quarter of Section 10, Township 119 North, Range 52, West of the 5th P.M., Codington County, South Dakota
(151 acres)

North 60 acres of SW1/4 of Section 2, Township 119 North, Range 52, West of the 5th P.M., Codington County, South Dakota
(60 acres)

Neil L. Quitsch

RECORDING REQUESTED BY,
AND AFTER RECORDING,
RETURN TO:
DHan James, Project Administrator
Wahpeton Wind, LLC
200 Royal Oaks Blvd, A3
Franklin, TN 37067
Tele: 615.418.3210

INSTRUMENT NO. 201500923 Pages: 5
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 4927

3/11/2015 4:02:00 PM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: DHAN JAMES PROJECT ADMINISTF

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, **effective on** February 13, 2015, by and between Melvin or Ronda Thompson (collectively or individually, the "**Landowner**"), whose **address is** 45878 155th St. South Shaft, SD 57263 and **WAHPETON WIND ~~FARM~~ JN, LLC**, a Colorado limited liability company ("**Lessee**"), whose address is 125 South Howes Street, Suite 870, Fort Collins, CO 80521, in light of the following facts and circumstances:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, **Landowner and Lessee hereby agree** as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate; and

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more turbines on the Property or on other property within the Project, and any such wind turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18)

months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signatures appear on the next Page

IN WITNESS WHEREOF, Landowner and Lessee have caused this Lease Short Form to be executed and delivered by their duly authorized representatives as of the date first written above.

LESSEE: **WAHPETON WIND, LLC,**
a Colorado limited liability company

By: Jim Newcomb

Printed Name: Jim Newcomb

Title: Manager

STATE OF Colorado COUNTY OF Larimer (Where signed)

The foregoing instrument was subscribed and acknowledged before me this 17th day of February, 2015, by Jim Newcomb, a Representative of the Colorado limited liability company, on behalf of the limited liability company.

KATE MILLER
Notary Public
State of Colorado
Notary ID 20014008717
My Commission Expires Mar 20, 2017

Kate Miller
Notary Public for Colorado

My commission expires: 3-20-2017

LANDOWNER:

By: Melvin L Thompson

Printed Name: Melvin L. Thompson

By: Ronda Thompson

Printed Name: Ronda Thompson

STATE OF SD COUNTY OF Codington (Where signed)

This instrument was subscribed and acknowledged before me on this 13 day of Feb, 2015, by Melvin & Ronda Thompson.

RAVONNE LUKONEN
NOTARY PUBLIC
SOUTH DAKOTA
SEAL SEAL

Notary Public for Watertown

My commission Expires: 10-15-2019

RaVonne Lukonen

Exhibit A

Description of the Property (Melvin L. Thompson) and (Ronda L. Thompson)

All that real property located in Codington County, South Dakota, described as follows:

Southwest Quarter and the South Half of the Northwest Quarter and Government Lots 3 and 4, Section 5, Township 119 North, Range 51 West of the Fifth Principal Meridian, Codington County, South Dakota, subject to public right of way.
(307 acres)
The Southeast Quarter (SE1/4) of Section 2 and the Northeast Quarter (NE1/4) of Section 11, all in Township 119 North, of Range 52 West of the Fifth Principal Meridian in Codington County, South Dakota.
(320 acres)

INSTRUMENT NO. 201504220 Pages: 5
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 5314

9/17/2015 3:44:28 PM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

RECORDING REQUESTED BY,
AND AFTER RECORDING,
RETURN TO:
Wahpeton Wind, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

Prepared By Apex Clean Energy, Inc.

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, **effective on** March 8th, 20 15, by and between Jackie Zubke and Grace Zubke (collectively or individually, the "**Landowner**"), whose **address is** 45785 159th St., Watertown, S.D. 57201, and **WAHPETON WIND ~~FARM~~, LLC,** a Colorado limited liability company ("**Lessee**"), whose address is 125 South Howes Street, Suite 870, Fort Collins, CO 80521, in light of the following facts and circumstances:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on **Exhibit A** attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, **Landowner and Lessee hereby agree** as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate; and

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more turbines on the Property or on other property within the Project, and any such wind turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18)

months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signatures appear on the next Page

IN WITNESS WHEREOF, Landowner and Lessee have caused this Lease Short Form to be executed and delivered by their duly authorized representatives as of the date first written above.

LESSEE: **WAHPETON WIND, LLC,**
a Colorado limited liability company

By: D'Han James
Printed Name: D'Han James

Title: Asst. Project Manager

STATE OF South Dakota COUNTY OF Codington (Where signed)

The foregoing instrument was subscribed and acknowledged before me this 8th day of March, 2015, by D'Han James, a Representative of the Colorado limited liability company, on behalf of the limited liability company.

Kathleen Meyer
KATHLEEN MEYER SEAL NOTARY PUBLIC SEAL SOUTH DAKOTA

Notary Public for Codington Co SD

My commission expires: 4/22/2015

LANDOWNER:

By: Jackie Zubke
Printed Name: Jackie Zubke

By: Grace Zubke

Printed Name: Grace Zubke

STATE OF South Dakota COUNTY OF Codington (Where signed)

This instrument was subscribed and acknowledged before me on this 8th day of March, 2015, by Jackie Zubke and Grace Zubke Kathleen Meyer.

KATHLEEN MEYER SEAL NOTARY PUBLIC SEAL SOUTH DAKOTA

Notary Public for Cod. Co SD

My commission Expires: 4/22/2015

EXHIBIT A

Description of the Property

All that real property located in Codington County, South Dakota, described as follows:

The Northwest Quarter of Section 26, Township 119 North, Range 52 West of the 5th P.M., subject to public right of way, Codington County, South Dakota
(160 acres)

The Northeast Quarter of Section 34, Township 119 North, Range 52, West of the 5th P.M., subject to highway rights of way, visible or recorded easements, and reservations of record, if any.
(146 acres)

RECORDING REQUESTED BY,
AND AFTER RECORDING,
RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201504015 Pages: 6
BOOK: 4T EASEMENT
PAGE: 5282

9/3/2015 11:03:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on April 10, 2015, by and between A.M. Farms, Inc. (collectively or individually, the "**Landowner**"), whose address is 17271 460th Ave, Watertown, SD 57201 and **DAKOTA RANGE I, LLC**, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to

which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow:

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 27th day of July, 2015 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

ANN LEIGH WATTS
Notary Public - Reg. # 7615616
Commonwealth of Virginia
My Commission Expires Mar. 31, 2018

Ann Leigh Watts
Notary Public

LANDOWNER:

By: Daniel Miller
Printed Name: Daniel Miller

By: A.M. Farms Inc. (President)
Printed Name: _____

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 10th day of April, 2015 before me, the undersigned officer, personally appeared Daniel Miller _____, ~~husband and wife/a married person/a single person,~~ known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that (he)/~~she/they~~ executed the same for the purpose therein contained.

Witness my hand and official seal.

Breanna Beebe
Notary Public for First Premier Bank
My commission expires: _____

BREANNA BEEBE
NOTARY PUBLIC
SOUTH DAKOTA
SEAL

My Commission Expires
September 8, 2016

EXHIBIT A

Description of the Property

All that real property located in Codington County, South Dakota, described as follows:

The Southwest Quarter of Section 21, Township 119, North of Range 52, West of the 5th P.M., less the North 379.7 Feet of the West 638 Feet thereof;

The Northwest Quarter of the Southeast Quarter of Section 21, Township 119, North of Range 52, West of the 5th P.M.;

The Southwest Quarter of the Southeast Quarter of Section 21, Township 119 North, of Range 52 West of the 5th P.M., subject to easements and reservations, visible or of record.

(236 acres)

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201504018 Pages: 6
BOOK: 4T EASEMENT
PAGE: 5285

9/3/2015 11:06:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on June 6, 2015, by and between Emil Mack, a married person (collectively or individually, the "**Landowner**"), whose address is 17390 Sheridan Rd, Watertown, SD 57201, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and

decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 25th day of August, 2015 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

_____
Notary Public

ANN LEIGH WATTS
Notary Public - Reg. # 7615616
Commonwealth of Virginia
My Commission Expires Mar. 31, 2018

LANDOWNER:

By: Emil Mack
Name: Emil Mack

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 6th day of June, 2015 before me, the undersigned officer, personally appeared Emil Mack, a married person/~~a single person~~, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/~~she/they~~ executed the same for the purpose therein contained.

Witness my hand and official seal.

KORY ALLEN
NOTARY PUBLIC
SOUTH DAKOTA
SEAL SEAL

Notary Public for South Dakota
My commission expires: 9-18-19

By: Renee Mack
Name: Renee Mack

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 6th day of June, 2015 before me, the undersigned officer, personally appeared Renee Mack, a married person/~~a single person~~, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that ~~he~~/she/~~they~~ executed the same for the purpose therein contained.

Witness my hand and official seal.

KORY ALLEN
NOTARY PUBLIC
SOUTH DAKOTA
SEAL SEAL

Notary Public for South Dakota
My commission expires: 9-18-19

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

Southwest Quarter (SW¼) Section One (1) and Northwest Quarter (NW¼) Section Twelve (12), all in Township One Hundred Nineteen (119), Range Fifty-Two (52), West of the 5th P.M., Codington County, South Dakota.

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201700892 Pages: 7
BOOK: 4T LEASE / EASEMENT AGREEMEN
PAGE: 6340

3/6/2017 12:29:00 PM
Ann Rasmussen
ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA
Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on November 2, 2016, by and between Jabe Kahnke Living Trust, dated August 6, 2014 (collectively or individually, the "**Landowner**"), whose address is 1326 42nd St. SW, Watertown, SD 57201, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County and Grant County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed

unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law**. This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Jeanine G. Wolanski
Title: Vice President of Land Management

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 16th day of November, 2016 by Jeanine G. Wolanski as the Vice President of Land Management for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

_____
Notary Public

JENNIFER REGINA CONNOR
NOTARY REGISTRATION NO. 7543896
NOTARY PUBLIC
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: MAY 31, 2017

LANDOWNER:

By: _____

Name: Mark Kienast, Administrative Trustee of the Jabe Kahnke Living Trust dated August 6, 2014

STATE OF South Dakota)
) ss.
COUNTY OF Codington)

On this 2 day of November, 2016, before me, the undersigned officer, personally appeared Mark Kienast, Administrative Trustee of the Jabe Kahnke Living Trust dated August 6, 2014, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

_____

Notary Public South Dakota
(State)

My commission expires: 4-8-22

DAVID LAU
NOTARY PUBLIC
SOUTH DAKOTA
SEAL SEAL

EXHIBIT "A"

Description of Property

All that real property located in Codington County and Grant County, South Dakota, described as follows:

Tract 1:

All of Section One (1), Township One Hundred Eighteen (118) North, of Range Fifty-two (52) West of the Fifth Principal Meridian, Codington County, South Dakota, except Thrun Addition in the Southeast Quarter of said Section One, except railroad right of way, and except all that portion of the East One Thousand Two Hundred Thirteen and seven-tenths feet (E1213.7') of the Southeast Quarter of said Section One lying South and West of the plat entitled: "Thrun Addition in the Southeast Quarter of Section One, Township One Hundred Eighteen North, Range Fifty-two West of the 5th P.M., Codington County, South Dakota".

Parcel Number: 14000000101180521100000 (591.71 acres)

Tract 2:

The Southwest Quarter of Section Twelve (12), in Township One Hundred Eighteen (118) North, of Range Fifty-two (52) West of the Fifth Principal Meridian, Codington County, South Dakota.

Parcel Number: 14000001201180523100000 (160.00 acres)

Tracts 3 and 4:

The Southeast Quarter (SE1/4) except that part thereof lying East of a line drawn diagonally from the midpoint of the North line of said Southeast Quarter to the Southeast corner of said Southeast Quarter; and the East Half of the Southwest Quarter (E1/2 SW1/4), all in Section Thirty-six (36), Township One Hundred Nineteen (119) North, Range Fifty-two (52) West of the Fifth P.M., Codington County, South Dakota.

Parcel Numbers: 05000003601190524100000 (120.00 acres)
05000003601190523100000 (80.00 acres)

Tract 5:

The Northeast Quarter (NE1/4) of Section Eleven (11), Township One Hundred Twenty (120) North of Range Fifty-two (52) West of the Fifth P.M., in the Sisseton and Wahpeton Indian Reservation, Grant County, South Dakota.

Parcel Number: 09.52.11.1000 (160.00 acres)

Tract 6:

The Southeast Quarter of Section Eleven (11), Township One Hundred Twenty (120) North of Range Fifty-two (52) West of the Fifth P.M., in the Sisseton and Wahpeton Indian Reservation, Grant County, South Dakota.

Parcel Number: 09.52.11.4000 (160.00 acres)

Tract 7:

The Southeast Quarter (SE1/4) of Section Twenty-two (22), in Township One Hundred Twenty (120) North, of Range Fifty-two (52) West of the Fifth P.M., Grant County, South Dakota.

Less and Except:

Lot H-4 in the SE¼ of Section 22, Township 120 North, Range 52 West of the 5th P.M., in Grant County, South Dakota, as shown by plat made by Wallace L. Larsen, Registered Land Surveyor, under date of February 12, 1973; said plat to be filed in the office of the Register of Deeds, Grant County, South Dakota.

Said Lot H-4 contains 9.30 acres, more or less.

Parcel Number: 11.52.22.4000 (150.70 acres)

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

INSTRUMENT NO. 201504019 Pages: 6
BOOK: 4T EASEMENT
PAGE: 5286

9/3/2015 11:07:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on June 22, 2015, by and between James B. Berg and Susan J. Berg (collectively or individually, the "**Landowner**"), whose address is 46913 South Dakota Hwy 20, Stockholm, SD 57264, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed

unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 20th day of July, 2015 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

_____
Notary Public

ANN LEIGH WATTS
Notary Public - Reg. # 7615616
Commonwealth of Virginia
My Commission Expires Mar. 31, 2018

LANDOWNER:

By: James B. Berg 6/22/15
Name: James B. Berg

STATE OF South Dakota)
) ss.
COUNTY OF Grant)

On this 22nd day of June, 2015, before me, the undersigned officer, personally appeared James B. Berg, ~~a married person/a single person~~, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that ~~he/she/they~~ executed the same for the purpose therein contained.

Witness my hand and official seal.

KATHLEEN MEYER SEAL NOTARY PUBLIC SEAL SOUTH DAKOTA

Kathleen Meyer
Notary Public for South Dakota
My commission expires: 4/22/2021

By: Susan J. Berg 6/22/15
Name: Susan J. Berg

STATE OF South Dakota)
) ss.
COUNTY OF Grant)

On this 22nd day of June, 2015, before me, the undersigned officer, personally appeared Susan J. Berg, ~~a married person/a single person~~, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that ~~he/she/they~~ executed the same for the purpose therein contained.

Witness my hand and official seal.

KATHLEEN MEYER SEAL NOTARY PUBLIC SEAL SOUTH DAKOTA

Kathleen Meyer
Notary Public for South Dakota
My commission expires: 4/22/2021

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

Tract 1:

The Southwest Quarter of Section 12, Township 119 North of Range 52 West of the 5th P.M., in Codington County, South Dakota, subject to visible or recorded easements, restrictions, conditions, covenants or reservations, if any.

Tract 2:

The Northwest Quarter less the North 709.5 Feet of the West 924 Feet in Section 13, Township 119 North of Range 52 West of the 5th P.M., in Codington County, South Dakota, subject to highway right-of-way, easements either visible or recorded, restrictions, conditions, covenants or reservations of record, if any.

INSTRUMENT NO. 201504020 Pages: 6
BOOK: 4T EASEMENT
PAGE: 5287

9/3/2015 11:08:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on June 30, 2015, by and between R. R. Imme Family LLP (collectively or individually, the "**Landowner**"), whose address is 906 18th Ave NE, Watertown, SD 57201, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. Term. Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. Ownership. Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. No Interference. Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. Lessee's Right to Terminate. Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed

unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 20th day of July, 2015 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

Ann Leigh Watts
Notary Public

ANN LEIGH WATTS
Notary Public - Reg. # 7615616
Commonwealth of Virginia
My Commission Expires Mar. 31, 2018

LANDOWNER:

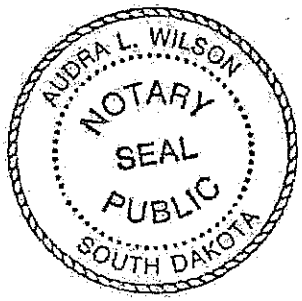
R. R. Imme Family LLP

By: Stacy Stanton
Name: Stacy Stanton
Title: Managing Partner

STATE OF South Dakota)
) ss.
COUNTY OF Kingsbury)

On this 30th day of June, 2015, before me, the undersigned officer, personally appeared Stacy Stanton as Managing Partner of R. R. Imme Family LLP, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.



Audra L. Wilson
Notary Public for Kingsbury, South Dakota
My commission expires: 10-17-2018

EXHIBIT "A"

Description of Property

All that real property located in Codington County, South Dakota, described as follows:

East One-Half (E1/2) of Section Thirteen (13), Township One Hundred Nineteen (119) North, of Range Fifty-two (52), West of the Fifth Principal Meridian, except .51 acres conveyed to Codington County for highway purposes by deed recorded in Book "123" of Deeds, Page 447, and except Lot H-I containing 2.49 acres which was conveyed to the State of South Dakota by Warranty Deed bearing date of October 8, 1954 and recorded in Book "175" of Deeds on Page 321 in office of Register of Deeds; and less the North 821.89 Feet of the South 1355.0 Feet of the East 1060.0 Feet of the Northeast Quarter of Section 13, Township 119 North, Range 52 West of the 5th P.M., Codington County, South Dakota, subject to Public Right of Way;

PREPARED BY,
AND AFTER RECORDING,
RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

Filed in - Grant County, Milbank, SD
Recorded on 9/4/2015 1:50 PM
Transaction # 1004182
Document # 229853
Book 273
Page 109 (7 pages) Rec. Fee $30.00
Nancy Copeland
Nancy Copeland, Register of Deeds
Return To:
APEX CLEAN ENERGY - JEANINE WOLANSKI
236 EAST HIGH STREET
CHARLOTTESVILLE, VA 22902

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on June 25, 2015, by and between Rosenfeld Hutterian Brethren, Inc., a South Dakota Religious Nonprofit Corporation, a/k/a Rosenfeld Hutterian Brethren, Inc., a corporation (collectively or individually, the "**Landowner**"), whose address is 36560 102nd Street, Forbes, ND 58439, and **DAKOTA RANGE I, LLC**, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Grant County and Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

INSTRUMENT NO. 201505152 Pages: 7
BOOK: 4T EASEMENT
PAGE: 5438

11/16/2015 11:36:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the

Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member
By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 20th day of July, 2015 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

ANN LEIGH WATTS
Notary Public - Reg. # 7615616
Commonwealth of Virginia
My Commission Expires Mar. 31, 2018

Ann Leigh Watts
Notary Public

LANDOWNER:
Rosenfeld Hutterian Brethren, Inc.,
a South Dakota Religious Nonprofit Corporation,
a/k/a Rosenfeld Hutterian Brethren, Inc., a corporation

By: _____
Title: Sec Treas

STATE OF North Dakota)
) ss.
COUNTY OF Dickey)

On this 24 day of June, 2015 before me, the undersigned officer, personally appeared Aaron Wipf, as Sec. Treas. of Rosenfeld Hutterian Brethren, Inc., a South Dakota Religious Nonprofit Corporation, a/k/a Rosenfeld Hutterian Brethren, Inc., a corporation, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

ALICIA KNUTSON
Notary Public
State of North Dakota
My Commission Expires May 2, 2020

_____
Notary Public for North Dakota
My commission expires: May 2, 2020

EXHIBIT "A"

Description of Property

All that real property located in Grant and Codington County, South Dakota, described as follows:

Tract 1:

The Southeast Quarter (SE¼), including Lot "A", in Section Six (6), Township One Hundred Twenty (120) North, Range Fifty-one (51) West of the 5th P.M., in the former Sisseton and Wahpeton Indian Reservation, Grant County, South Dakota; and

Tract 2:

The Southwest Quarter (SW ¼) of Section Five (5), Township One Hundred Twenty (120) North, Range Fifty-one (51) West of the 5th P.M., in the former Sisseton and Wahpeton Indian Reservation, Grant County, South Dakota.

Tract 3:

The Southeast Quarter (SE1/4) of Section 6, Township 119 North, Range 51 West of the 5th P.M., Codington County, South Dakota, except the South 12 Rods of the East 18 Rods for school purposes, and except that portion conveyed for highway right of way purposes by Quit Claim Deed filed in Book 179 of Deeds on page 493.

Tract 4:

Lots 6 and 7, and the East Half of the Southwest Quarter (E1/2SW1/4) also described as the Southwest Quarter (SW1/4) of Section 6, Township 119 North, Range 51 West of the 5th P.M., Codington County, South Dakota.

Tract 5:

the North West One Quarter (NW ¼) and the North one thousand five hundred forty five feet (N 1,545') of the North East One Quarter (NE ¼) of Section 24, Township 119 North, Range 52 West of the 5th P.M., Codington County, SD, less Lot H-1, and subject to the reservation of mineral rights and oil and gas rights in Grantor.

Tract 6:

the East One-half (E ½) of Section Twenty-four, except the North one thousand five hundred forty five feet (N 1,545') of the North East One Quarter (NE ¼), and except the East eight hundred eighty five feet (E 885') of the South seven hundred seventy eight feet (S 778'), and except the West two hundred sixty one feet (W 261') of the East one thousand one hundred forty six feet (E 1,146') of the South one thousand five hundred twenty six and one half feet (S 1,526.5'), and except the West four hundred nine feet (W 409') of the East one thousand five hundred fifty five feet (E 1,555') of the South one thousand seventy feet (S 1,070') of the South East One Quarter (SE1/4) of Section 24, Township 119 North, Range 52 West of the 5th P.M., Codington County, SD, less Lot H-1, and subject to the reservation of mineral rights and oil and gas rights in Grantor.

Tract 7:

Government Lots One (1), Two (2), Three (3), Four (4) and the South Half of the Northeast Quarter (S½ NE¼) of Section Four (4), Township One Hundred Nineteen (119) North, Range Fifty-two (52) West of the 5th P.M., Codington County, South Dakota

PREPARED BY,
AND AFTER RECORDING,
RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

Filed in - Grant County, Milbank, SD
Recorded on 9/4/2015 1:50 PM
Transaction # 1004182
Document # 229853
Book 273
Page 109 (7 pages) Rec. Fee $30.00
Nancy Copeland
Nancy Copeland, Register of Deeds
Return To:
APEX CLEAN ENERGY - JEANINE WOLANSKI
236 EAST HIGH STREET
CHARLOTTESVILLE, VA 22902

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on June 25, 2015, by and between Rosenfeld Hutterian Brethren, Inc., a South Dakota Religious Nonprofit Corporation, a/k/a Rosenfeld Hutterian Brethren, Inc., a corporation (collectively or individually, the "**Landowner**"), whose address is 36560 102nd Street, Forbes, ND 58439, and **DAKOTA RANGE I, LLC**, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Grant County and Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the

Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Mark W. Goodwin
Title: President

COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 20th day of July, 2015 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

ANN LEIGH WATTS
Notary Public - Reg. # 7615616
Commonwealth of Virginia
My Commission Expires Mar. 31, 2018

Ann Leigh Watts
Notary Public

LANDOWNER:
Rosenfeld Hutterian Brethren, Inc.,
a South Dakota Religious Nonprofit Corporation,
a/k/a Rosenfeld Hutterian Brethren, Inc., a corporation

By: Aaron Wipf
Title: Sec Treas

STATE OF North Dakota)
) ss.
COUNTY OF Dickey)

On this 24 day of June, 2015 before me, the undersigned officer, personally appeared Aaron Wipf, as Sec. Tres. of Rosenfeld Hutterian Brethren, Inc., a South Dakota Religious Nonprofit Corporation, a/k/a Rosenfeld Hutterian Brethren, Inc., a corporation, known to me or satisfactorily proven to be the person(s) whose name(s) is subscribed to the within instrument, and acknowledged that he/she/they executed the same for the purpose therein contained.

Witness my hand and official seal.

ALICIA KNUTSON
Notary Public
State of North Dakota
My Commission Expires May 2, 2020

Notary Public for North Dakota
My commission expires: May 2, 2020

EXHIBIT "A"

Description of Property

All that real property located in Grant and Codington County, South Dakota, described as follows:

Tract 1:

The Southeast Quarter (SE¼), including Lot "A", in Section Six (6), Township One Hundred Twenty (120) North, Range Fifty-one (51) West of the 5th P.M., in the former Sisseton and Wahpeton Indian Reservation, Grant County, South Dakota; and

Tract 2:

The Southwest Quarter (SW ¼) of Section Five (5), Township One Hundred Twenty (120) North, Range Fifty-one (51) West of the 5th P.M., in the former Sisseton and Wahpeton Indian Reservation, Grant County, South Dakota.

Tract 3:

The Southeast Quarter (SE1/4) of Section 6, Township 119 North, Range 51 West of the 5th P.M., Codington County, South Dakota, except the South 12 Rods of the East 18 Rods for school purposes, and except that portion conveyed for highway right of way purposes by Quit Claim Deed filed in Book 179 of Deeds on page 493.

Tract 4:

Lots 6 and 7, and the East Half of the Southwest Quarter (E1/2SW1/4) also described as the Southwest Quarter (SW1/4) of Section 6, Township 119 North, Range 51 West of the 5th P.M., Codington County, South Dakota.

Tract 5:

the North West One Quarter (NW ¼) and the North one thousand five hundred forty five feet (N 1,545') of the North East One Quarter (NE ¼) of Section 24, Township 119 North, Range 52 West of the 5th P.M., Codington County, SD, less Lot H-1, and subject to the reservation of mineral rights and oil and gas rights in Grantor.

Tract 6:

the East One-half (E ½) of Section Twenty-four, except the North one thousand five hundred forty five feet (N 1,545') of the North East One Quarter (NE ¼), and except the East eight hundred eighty five feet (E 885') of the South seven hundred seventy eight feet (S 778'), and except the West two hundred sixty one feet (W 261') of the East one thousand one hundred forty six feet (E 1,146') of the South one thousand five hundred twenty six and one half feet (S 1,526.5'), and except the West four hundred nine feet (W 409') of the East one thousand five hundred fifty five feet (E 1,555') of the South one thousand seventy feet (S 1,070') of the South East One Quarter (SE1/4) of Section 24, Township 119 North, Range 52 West of the 5th P.M., Codington County, SD, less Lot H-1, and subject to the reservation of mineral rights and oil and gas rights in Grantor.

Tract 7:

Government Lots One (1), Two (2), Three (3), Four (4) and the South Half of the Northeast Quarter (S½ NE¼) of Section Four (4), Township One Hundred Nineteen (119) North, Range Fifty-two (52) West of the 5th P.M., Codington County, South Dakota

INSTRUMENT NO. 201504021 Pages: 6
BOOK: 4T EASEMENT
PAGE: 5288

9/3/2015 11:09:00 AM

ANN RASMUSSEN, REGISTER OF DEEDS
CODINGTON COUNTY, SOUTH DAKOTA

Recording Fee: 30.00
Return To: APEX CLEAN ENERGY

PREPARED BY AND
AFTER RECORDING RETURN TO:
Dakota Range I, LLC
c/o Apex Clean Energy, Inc.
Queen Charlotte Building
236 East High Street
Charlottesville, VA 22902
Attn: Eugene Lerman, Esq.
(434) 220-7595

SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT

This **SHORT FORM OF WIND ENERGY LEASE AND WIND EASEMENT AGREEMENT** (this "**Lease Short Form**") is made, effective on June 30, 2015, by and between Allen D. Stark and Dianne M. Stark, husband and wife (collectively or individually, the "**Landowner**"), whose address is 16116 457th Ave, Watertown, SD 57201, and Dakota Range I, LLC, a Delaware limited liability company ("**Lessee**"), whose address is c/o Apex Clean Energy, Inc., Court Square Building, 310 4th Street NE, Suite 200, Charlottesville, Virginia 22902, with respect to the following:

Landowner and Lessee entered in that certain Wind Energy Lease and Wind Easement Agreement, of even date herewith (the "**Lease Agreement**"), pursuant to which Landowner has leased to Lessee the real property of Landowner (the "**Property**") located in Codington County, South Dakota, as more particularly described on Exhibit A attached hereto and which Lease Agreement and said Exhibit A are hereby incorporated herein as if fully set forth in this Lease Short Form. Landowner and Lessee have executed and acknowledged this Lease Short Form for the purpose of providing constructive notice of the Lease Agreement. Capitalized terms not otherwise defined in this Lease Short Form shall have the meanings provided in the Lease Agreement. In the event of any conflict or inconsistency between the provisions of this Lease Short Form and the provisions of the Lease Agreement, the provisions of the Lease Agreement will control. Nothing in this Lease Short Form shall be deemed to amend, modify, change, alter, amplify, restrict or supersede any provision of the Lease Agreement or otherwise limit or expand the rights and obligations of the parties under the Lease Agreement. The Lease Agreement shall control over this Lease Short Form in all events.

NOW THEREFORE, Landowner and Lessee hereby agree as follows:

1. **Lease of Property; Easements.** Landowner leases the Property to Lessee on the terms, covenants and conditions stated in the Lease Agreement. The lease created by the Lease Agreement is solely and exclusively for wind energy purposes, as defined in the Lease Agreement, and Lessee shall have the exclusive right to use the Property for wind energy purposes, together with certain related access and easement rights and other rights related to the Property as more fully described in the Lease Agreement, including

(i) the right to extract soil samples, perform geotechnical tests, and conduct such other tests, studies, inspections and analysis on the Property as Lessee deems necessary, useful or appropriate;

(ii) construct, erect, install, reinstall, replace, relocate and remove Windpower Facilities on the Property; and

(iii) use, maintain and operate Windpower Facilities on the Property, subject in any case to certain restrictions on use of the Property. Reference is hereby made to the Lease Agreement for a complete description of the respective rights and obligations of the parties regarding the Property and the covenants, conditions, restrictions and easements affecting the Property pursuant to the Lease Agreement.

2. **Term.** Lessee's rights under the Lease Agreement shall commence on the Effective Date and expire on the date five (5) years thereafter as set forth in the Lease Agreement (the "**Development Period**"). If Lessee or any Assignee or Tenant installs one or more Turbines on the Property or on other property within the Project, and any such Turbine generates electricity as set forth in the Lease Agreement, then the Lease Agreement shall automatically be extended for an Extended Term of thirty (30) years. In that event, the Extended Term shall commence on the Operations Date. During the Extended Term, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the Extended Term, elect to extend the Lease Agreement for an additional five-year period commencing upon the expiration of the Extended Term (the "**First Renewal Term**"). Similarly, Lessee and any Tenant or Assignee may, by notice to Landowner no later than thirty (30) days prior to the expiration of the First Renewal Term, elect to extend the Lease Agreement for a second five-year period commencing upon the expiration of the First Renewal Term (the "**Second Renewal Term**"). With respect to each extension of the term of the Lease Agreement, Landowner and Lessee shall execute in recordable form, and Lessee shall then record, a memorandum evidencing the extension, satisfactory in form and substance to Lessee.

3. **Ownership.** Landowner shall have no ownership or other interest in any Windpower Facilities installed on the Property, and Lessee may remove any or all Windpower Facilities at any time.

4. **No Interference.** Among other things, the Lease Agreement provides that Landowner's activities and any grant of rights Landowner makes to any person or entity, whether located on the Property, shall not, currently or in the future, impede or interfere with: (i) the siting, permitting, construction, installation, maintenance, operation, replacement, or removal of Windpower Facilities, whether located on the Property; (ii) the flow of wind, wind speed or wind direction over the Property; (iii) access over the Property to Windpower Facilities, whether located on the Property; or (iv) the undertaking of any other activities of Lessee permitted under the Lease Agreement. In no event during the term of the Lease Agreement shall Landowner construct, build or locate or allow anyone other than Lessee to construct, build or locate any wind energy conversion system, wind turbine or similar project on the Property.

5. **Lessee's Right to Terminate.** Lessee shall have the right to terminate the Lease Agreement as to all or any part of the Property at any time, for any reason and in its sole discretion, effective upon thirty (30) days' written notice to Landowner. Lessee shall, no later than eighteen (18) months thereafter, remove all above-ground Windpower Facilities from the Property or portion as to which the Lease Agreement was terminated in compliance with all applicable governmental permitting and decommissioning requirements and restore the soil surface to a condition reasonably similar to its original condition; provided, however, that unless otherwise required by applicable law, roads will not be removed

unless Landowner delivers written notice to Lessee within thirty (30) days following termination of the Lease Agreement that Landowner wishes for such roads to be removed, which notice shall be in recordable form.

6. **Successors and Assigns.** The Lease Agreement and any easement or rights granted Lessee therein shall burden the Property and shall run with the land. The Lease Agreement shall inure to the benefit of and be binding upon Landowner and Lessee and, to the extent provided in any assignment or other transfer under the Lease Agreement, any Assignee or Tenant, and their respective heirs, transferees, successors and assigns, and all persons claiming under them.

7. **Multiple Counterparts.** This Lease Short Form may be executed by different parties on separate counterparts, each of which, when so executed and delivered, shall be an original, but all such counterparts shall constitute one and the same instrument.

8. **Governing Law.** This Lease Short Form and the Lease Agreement shall be governed by and interpreted in accordance with the laws of the State of South Dakota.

Signature Pages Follow

IN WITNESS WHEREOF, Landowner and Lessee have caused this Short Form to be executed and delivered by their duly authorized representatives as of the Effective Date.

LESSEE:

DAKOTA RANGE I, LLC,
a Delaware limited liability company

By: Apex GCL, LLC,
a Delaware limited liability company,
its sole member

By: Apex Clean Energy Holdings, LLC,
a Delaware limited liability company,
its sole member

By: _____
Name: Mark W. Goodwin
Title: President

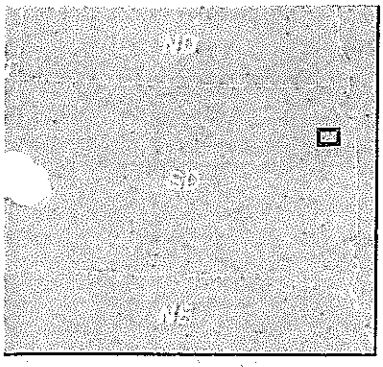
COMMONWEALTH OF VIRGINIA

CITY OF CHARLOTTESVILLE

The foregoing instrument was acknowledged before me this 20th day of July, 2015 by Mark W. Goodwin as the President for Apex Clean Energy Holdings, LLC, a Delaware limited liability company, the sole member of Apex GCL, LLC, a Delaware limited liability company, the sole member of Dakota Range I, LLC, a Delaware limited liability company, on behalf of the company.

_____
Notary Public

ANN LEIGH WATTS
Notary Public - Reg. # 7615616
Commonwealth of Virginia
My Commission Expires Mar. 31, 2018



Dakota Range: Map of Easements

- Project Boundary
- County Boundary
- Parcel Boundary
- Proposed Turbine

Existing Transmission

- 34kV5 - 69kV
- 240kV - 345kV
- 100kV - 138kV

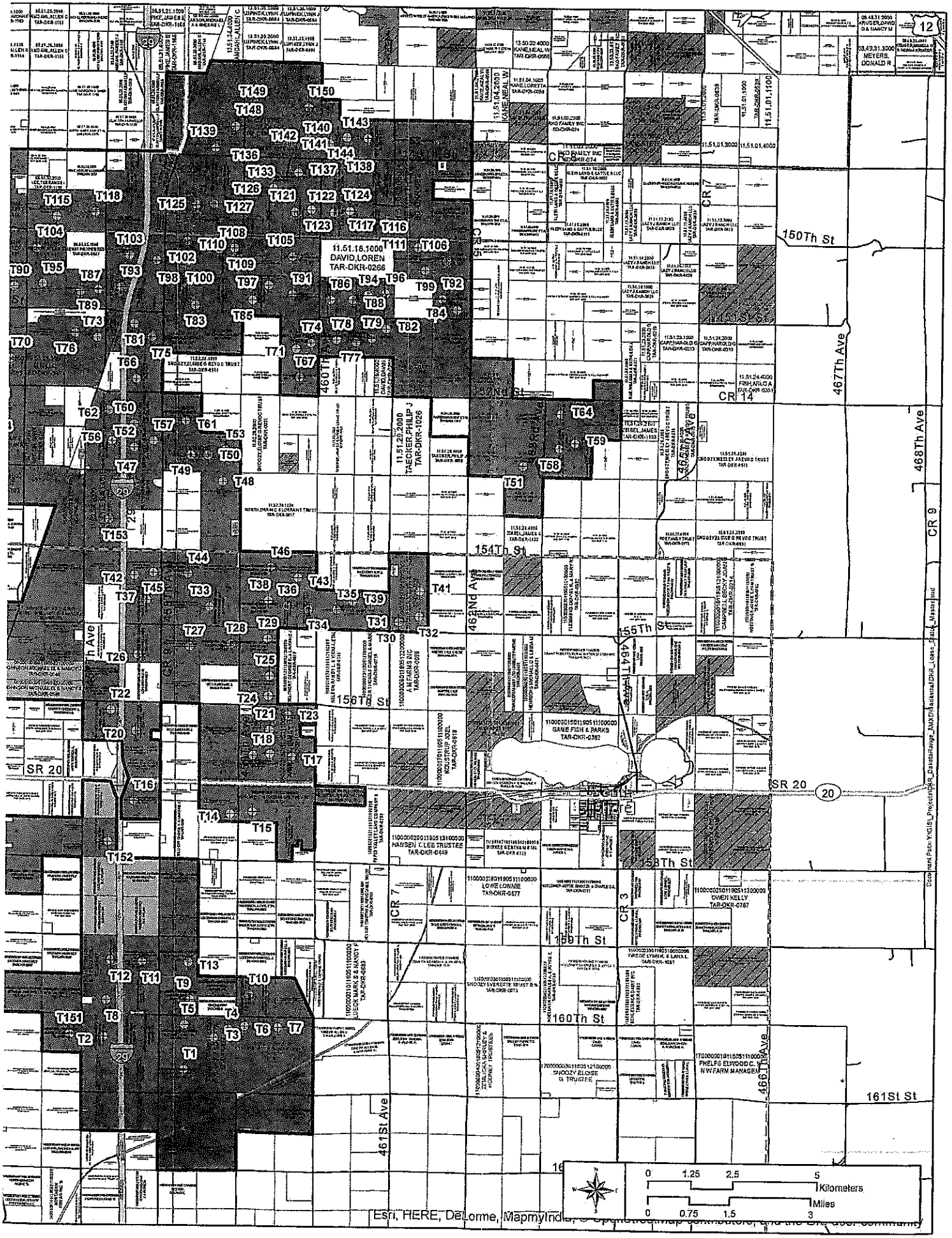
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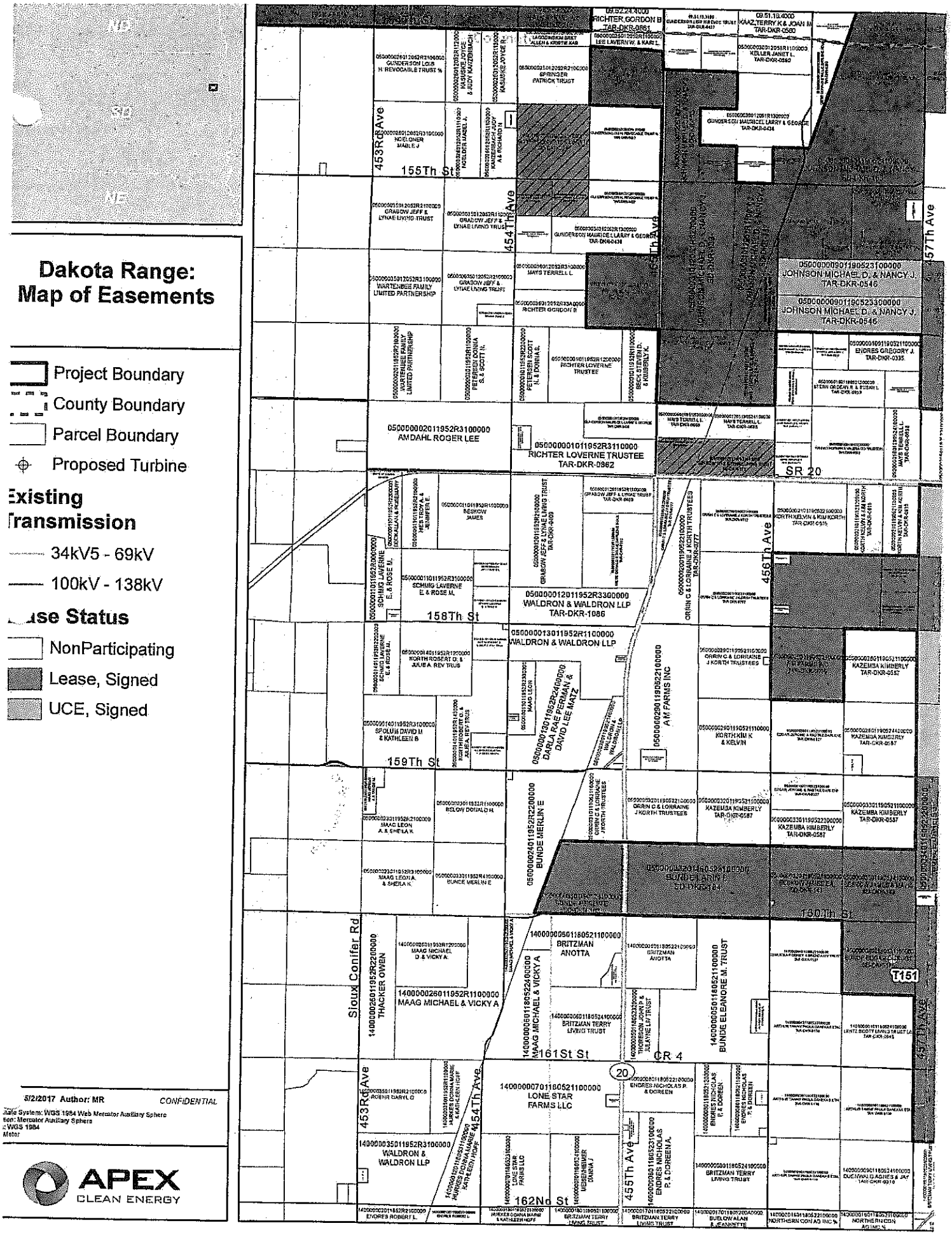
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- UCE, Signed

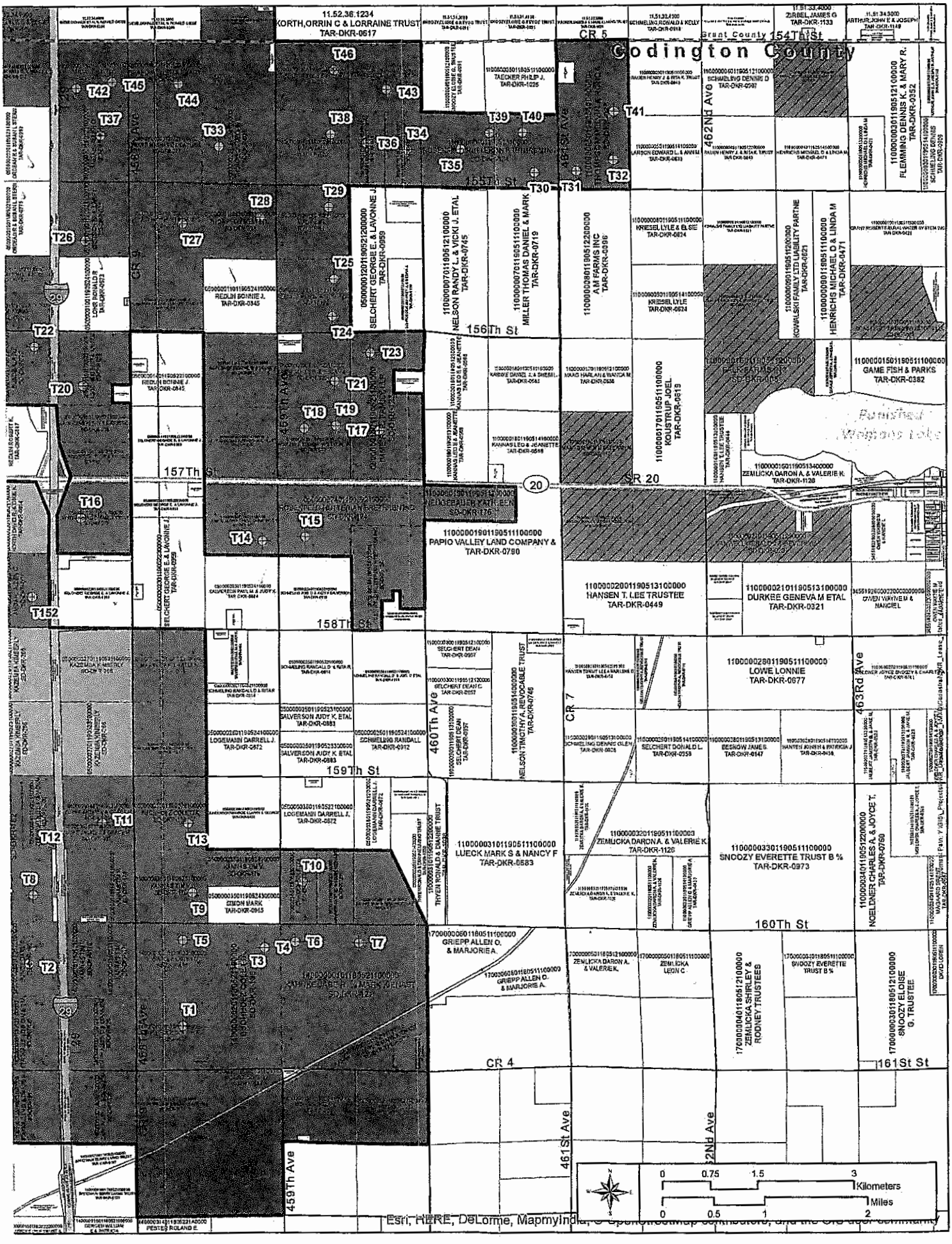
5/2/2017 Author: MR CONFIDENTIAL

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Datum: WGS 1984
Units: Meter

APEX CLEAN ENERGY

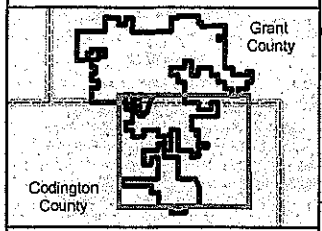

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HOSTETTLER BRENT & JENNIFER


Dakota Range:
Map of Easements
Project Boundary
County Boundary
Parcel Boundary
Proposed Turbine
Existing Transmission
34kV5 - 69kV
100kV - 138kV
Lease Status
NonParticipating
Lease, Signed
UCE, Signed
5/2/2017 Author: MR
CONFIDENTIAL
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158Th St
159Th St
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Codington County
Grant County
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KRIESEL LYLE
TAR-DKR-0624
SCHUMELING,RONALD & KELLY
TAR-DKR-0918
SCHUMELING DENNIS D
TAR-DKR-0797
LARSON EDWARD L & ANNE M
TAR-DKR-0833
RAUEN HENRY J & RITA K TRUST
TAR-DKR-0849
HENRICHS MICHAEL D & LINDA M
TAR-DKR-0471
KOWALSKI FAMILY LTD LIABILITY PARTNE
TAR-DKR-0621
ZIRBEL,JAMES G
TAR-DKR-1133
ARTHUR,JOHN E & JOSEPH
TAR-DKR-1149
FLEMMING DENNIS K. & MARY R.
TAR-DKR-0352
SCHUMELING DENNIS
TAR-DKR-0393
GRANT ROBERTS RURAL WATER SYSTEM INC
TAR-DKR-0421
GAME FISH & PARKS
TAR-DKR-0382
Bullshead Wetland Area
Bullshead Waterfowl Production Area
Bullshead Lake
ZEMLICKA DARON A. & VALERIE K.
TAR-DKR-1126
KOUSTRUP JOEL
TAR-DKR-0519
HANSEN T. LEE TRUSTEE
TAR-DKR-0449
DURKEE GENEVA M ETAL
TAR-DKR-0321
LOWE LONNIE
TAR-DKR-0677
SELCHERT DONALD L.
TAR-DKR-0558
BESKOW JAMES
TAR-DKR-0147
SNOOZY EVERETTE TRUST B %
TAR-DKR-0973
NELSON TIMOTHY A. REVOCABLE TRUST
TAR-DKR-0746
PAPIO VALLEY LAND COMPANY &
TAR-DKR-0790
LUECK MARK S & NANCY F
TAR-DKR-0583
GRIEPP ALLEN O. & MARJORIE A.
ZEMLICKA DARON A. & VALERIE K.
ZEMLICKA LEON C.
ZEMLICKA SHIRLEY & RODNEY TRUSTEES
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NGELDNER CHARLES A. & JOYCE T.
TAR-DKR-0760
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TAR-DKR-0957
SELCHERT DEAN C.
TAR-DKR-0557
SAUVERSON JUDY K. ETAL
TAR-DKR-0883
SCHUMELING RANDALL
TAR-DKR-0912
LOGEMANN DARRELL J.
TAR-DKR-0572
SIMON MARK
TAR-DKR-0965
REDLIN BONNIE J.
TAR-DKR-0345
REDLIN ROBERT K.
TAR-DKR-0845
SELCHERT GEORGE E. & LAVONNE J.
TAR-DKR-0959
PESTES ROLAND E.
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
0 0.75 1.5 3 Kilometers
0 0.5 1 2 Miles

Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017



- Proposed Turbine
- Proposed Private Access Road
- Proposed Collection Line
- Parcel Boundary
- Map Page
- Project Boundary
- Participating Parcel

All locations of turbines, access roads, substations, transmission lines, and utility lines are approximate. Final locations depend on turbine model, federal and state permitting, and local micro-siting. All final turbine locations will adhere to applicable County and State requirements.

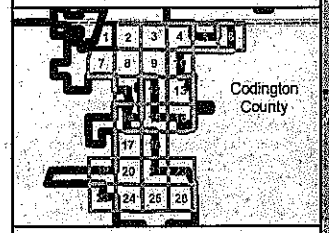
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Projection: Lambert Conformal Conic
Datum: North American 1983

APEX CLEAN ENERGY

Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017



- Proposed Turbine
- Proposed Private Access
- Proposed Collection Line
- Existing Public Road
- Parcel Boundary
- Occupied House Setback - 1,000Ft
- Public Road Setback- 541Ft
- Nonparticipating Parcel Setback - 541Ft
- Nonparticipating Parcel
- Project Boundary

All locations of turbines, access roads, substations, transmission lines, and utility lines are approximate. Final locations depend on turbine model, federal and state permitting, and local micro-siting. All final turbine locations will adhere to applicable County and State requirements.

Page: 1

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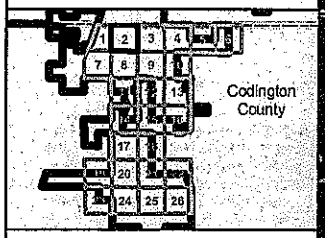
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Projection: Lambert Conformal Conic
Datum: North American 1983

APEX ENERGY



Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017



- Proposed Turbine
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All locations of turbines, access roads, substations, transmission lines, and utility lines are approximate. Final locations depend on turbine model, federal and state permitting, and local micro-siting. All final turbine locations will adhere to applicable County and State requirements.

Page: 2

0 95 190 380 570 760 950 Feet

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Projection: Lambert Conformal Conic
Datum: North American 1983

APEX CLEAN ENERGY

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KRIESE, KYLE E & ELSIE
11-52-34-2000

T120NR052W34

GIESE, DONALD ET AL % RONALD GIESE
11-52-34-4000

GIESE, DONALD ET AL % RONALD GIESE
11-52-35-3000

154Th

JOHNSON MICHAEL D & NANCY J
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AMDAHL ALLEN C
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T45

T42

457Th

T119NR052W04

T119NR052W03

T119NR052W02

T37

ORDEAN R & SUSAN L STERN
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AMDAHL ALLEN C
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T119NR052W09

ORDEAN R & SUSAN L STERN
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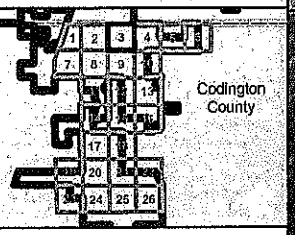
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QUITSCH NEIL LARRY
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T119NR052W11

Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017





- Proposed Turbine
- Proposed Private Access
- Proposed Collection Line
- Existing Public Road
- Parcel Boundary
- Occupied House Setback - 1,000Ft
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Page: 3

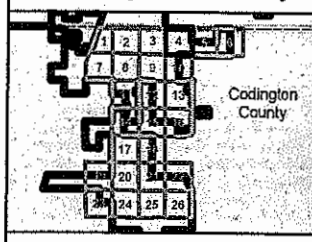
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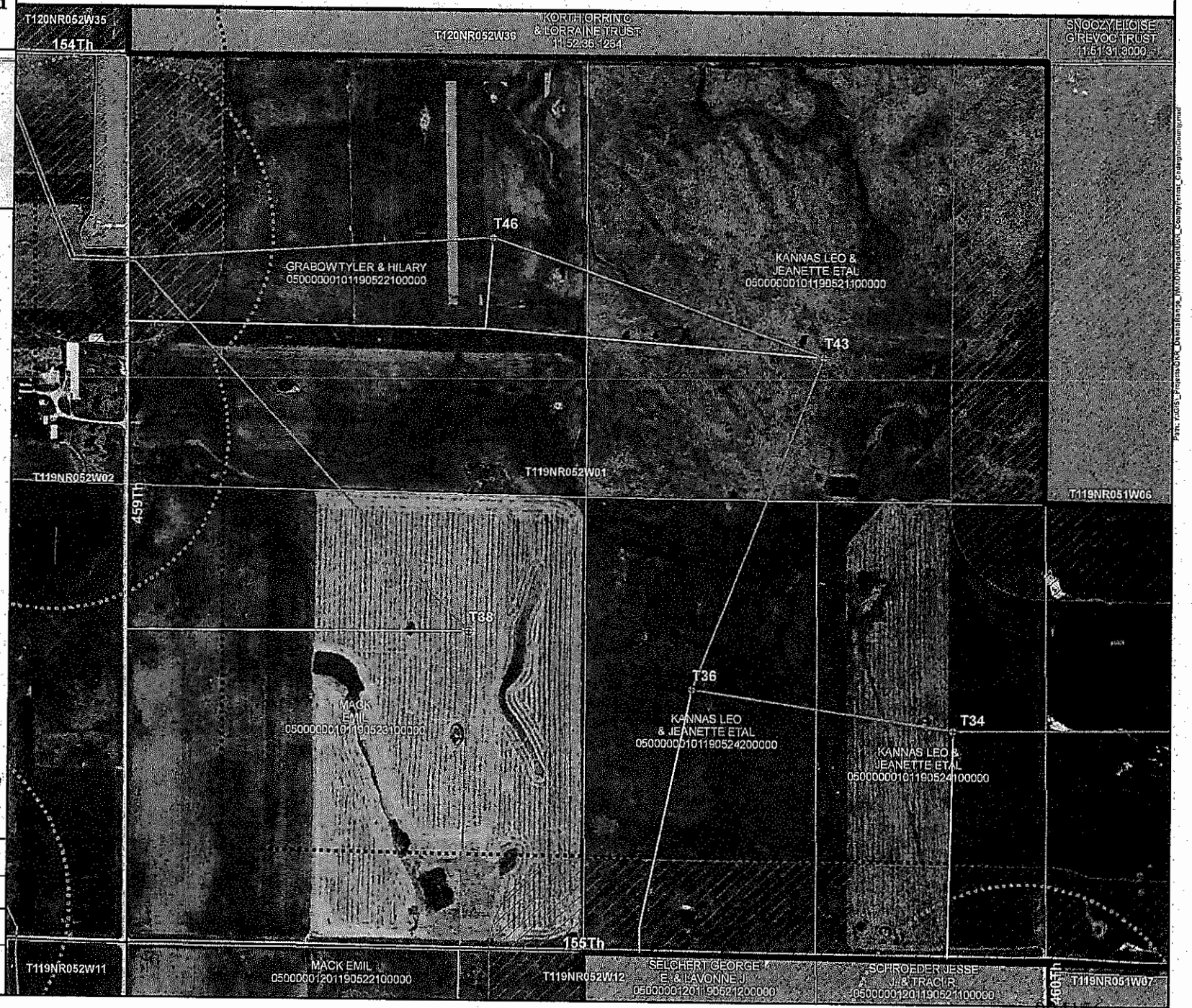
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Projection: Lambert Conformal Conic
Datum: North American 1983

APEX ENERGY

Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017





- Proposed Turbine
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- Nonparticipating Parcel Setback - 541Ft
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Page: 4

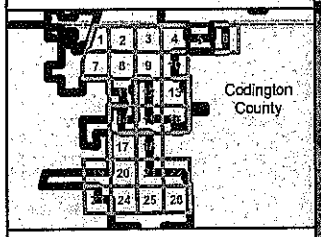
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NAD 1983 StatePlane South Dakota North FIPS 4001 Feet Projection: Lambert Conformal Conic Datum: North American 1983

APEX CLEAN ENERGY

Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017



- Proposed Turbine
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Page: 5

0 95 190 380 570 760 950 Feet

NAD 1983 StatePlane South Dakota North FIPS 4001 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983

APEX ENERGY

KORTH DORRIN C & LORRAINE TRUST
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SNOOZY ELOISE G REVOC TRUST
11 51 31 3000

T120NR051W31

SNOOZY ELOISE G REVOC TRUST
11 51 31 4000

TAECKER JAMES A & MAVIS K LIVING TRUST
11 51 32 3000

KANNAS LEO & JEANETTE ETAL
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SNOOZY ELOISE G TRUSTEE
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TAECKER PHILIP L
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T119NR052W01

T119NR051W06

THOMPSON MELVIN & RONDA
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T119NR051W05

T39

T40

T35

T34

ROSENFELD HUTTERIAN BRETHREN INC
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KANNAS LEO & JEANETTE ETAL
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T30

T31

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SCHROEDER JESSE J & TRACI R
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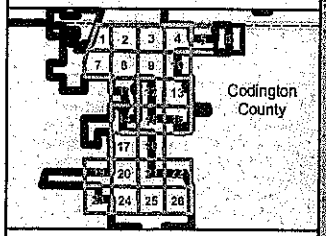
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MILLER THOMAS DANIEL & MARK
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T119NR051W08

Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017



- Proposed Turbine
- Proposed Private Access
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- Existing Public Road
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Page: 6

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Projection: Lambert Conformal Conic
Datum: North American 1983

APEX CLEAN ENERGY

TAECKER JAMES A & MAVIS K LIVING TRUST
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SCHMELING RONALD & KELLY
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RAUEN HENRY J & RITA K TRUST
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THOMPSON MELVIN & RONDA
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LARSON EDWARD L & ANN M
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AM FARMS INC
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KRIESEL LYLE & ELSIE
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T41 | T32 | T31

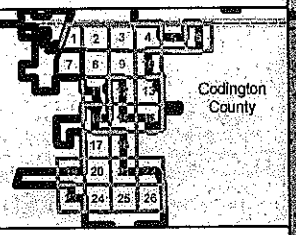
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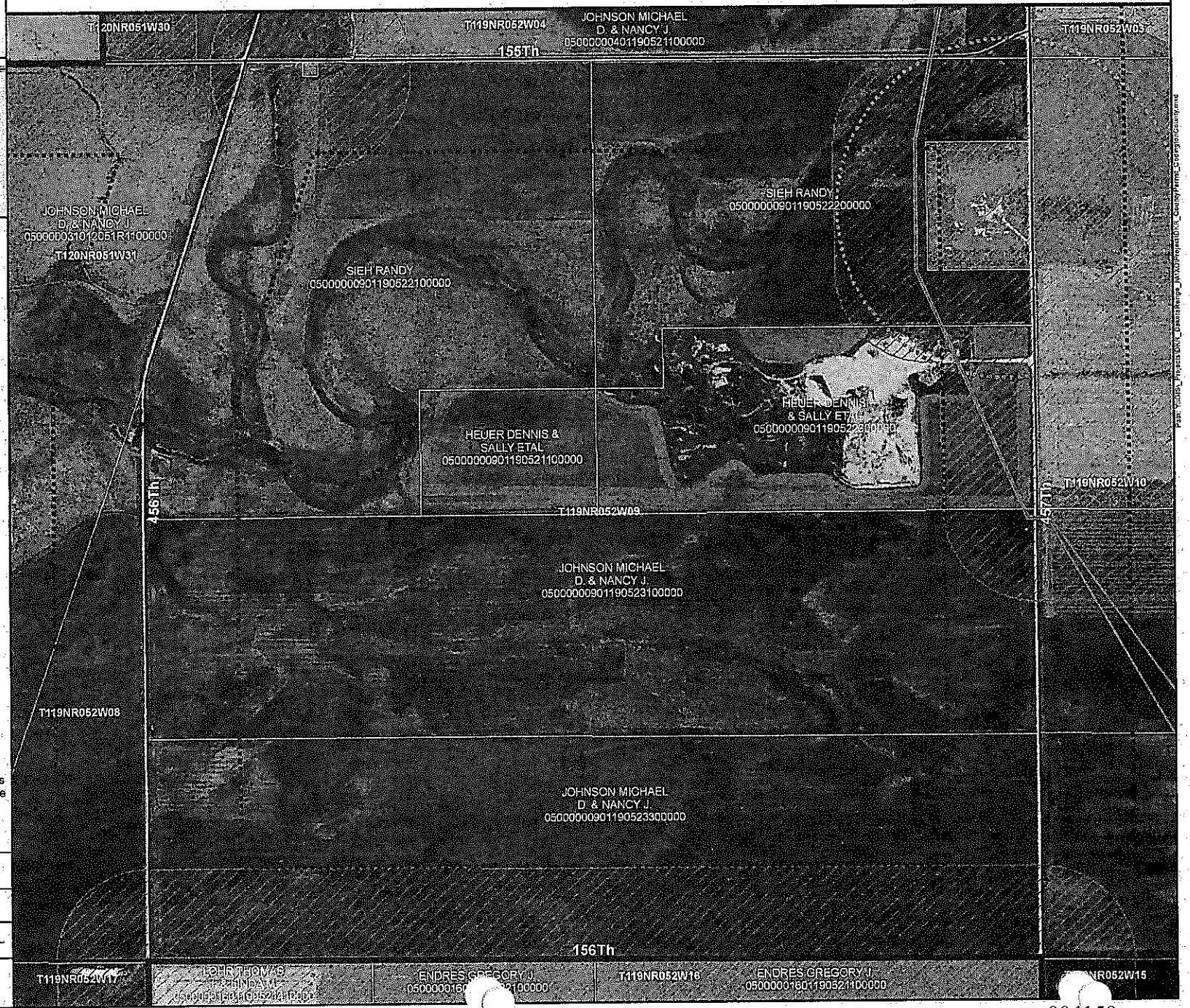
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Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017





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Page: 7

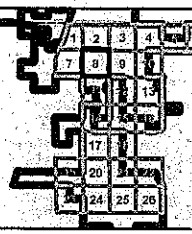
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Projection: Lambert Conformal Conic
Datum: North American 1983

APEX ENERGY

Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017



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Page: 8

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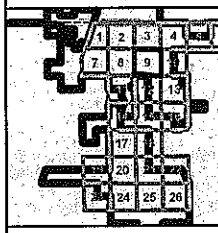
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Datum: North American 1983

APEX CLEAN ENERGY



Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017



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Page: 9

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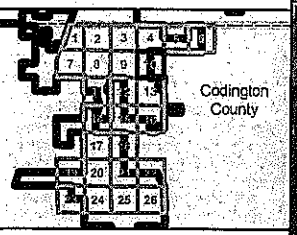
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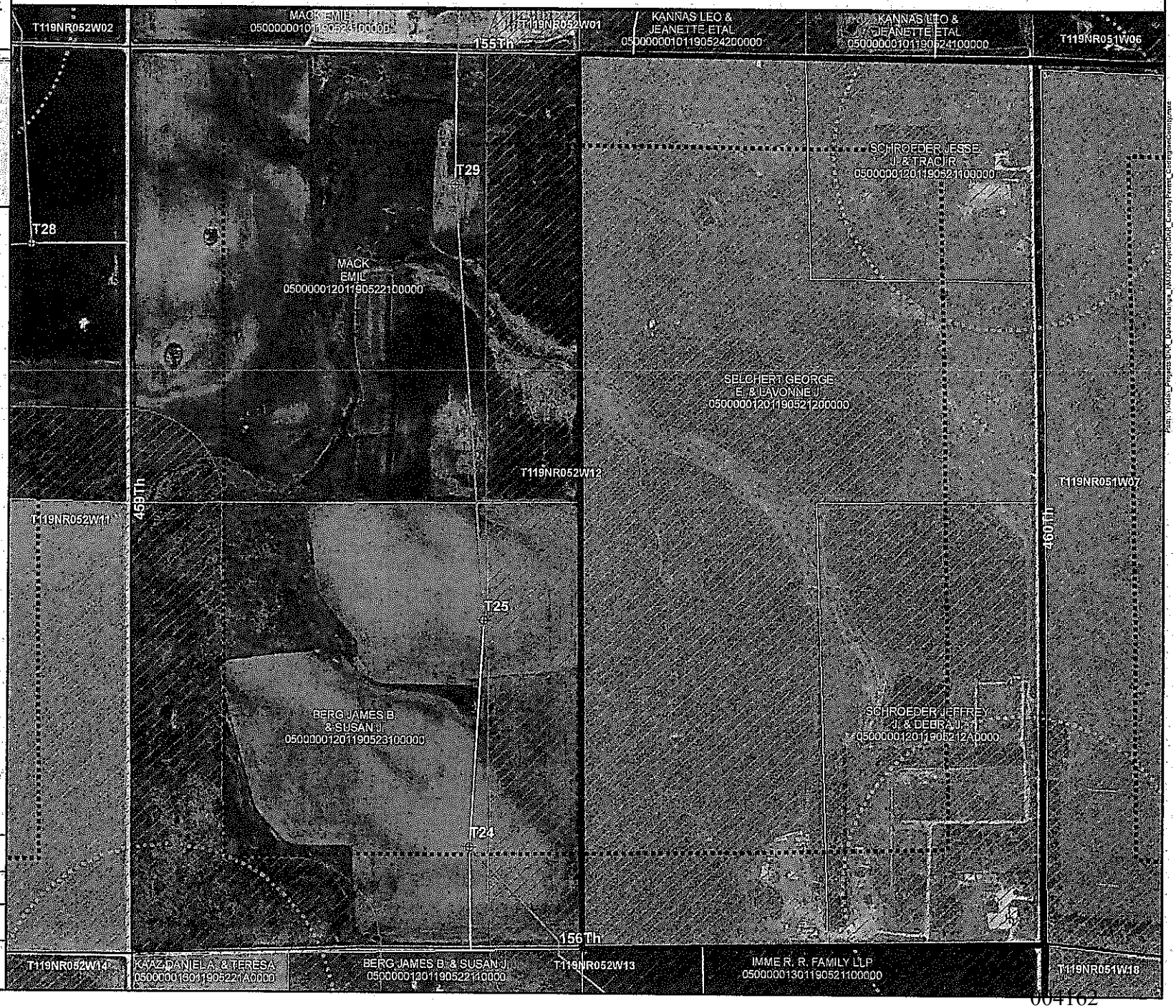
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REDLIN BONNIE J
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Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017





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Page: 10

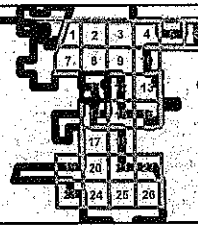
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APEX CLEAN ENERGY

Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017



- Proposed Turbine
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- Proposed Collection Line
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Page: 11

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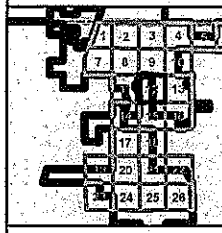
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APEX CLEAN ENERGY



Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017



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- Nonparticipating Parcel
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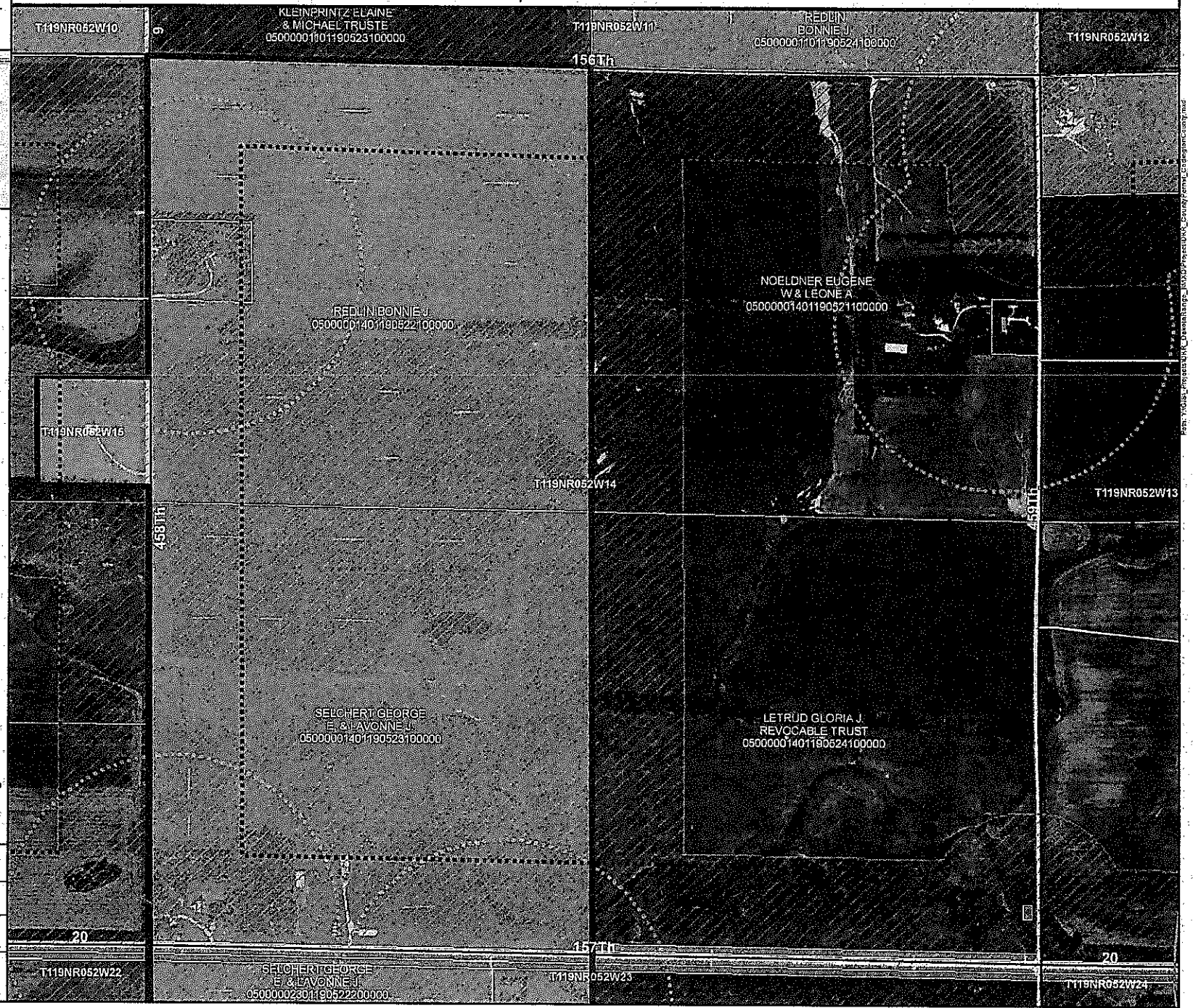
All locations of turbines, access roads, substations, transmission lines, and utility lines are approximate. Final locations depend on turbine model, federal and state permitting, and local micro-siting. All final turbine locations will adhere to applicable County and State requirements.

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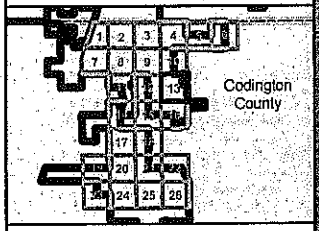
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Projection: Lambert Conformal Conic
Datum: North American 1983

APEX CLEAN ENERGY



Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017



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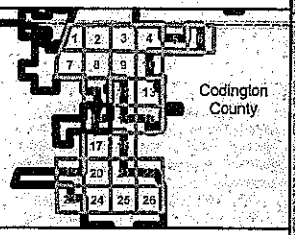
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Datum: North American 1983

APEX N ENERGY



Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017



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Page: 14

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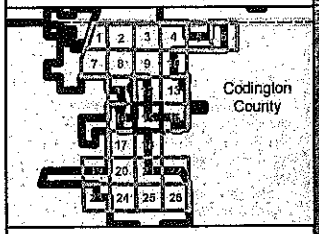
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Projection: Lambert Conformal Conic
Datum: North American 1983

APEX CLEAN ENERGY



Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017



- Proposed Turbine
- Proposed Private Access
- Proposed Collection Line
- Existing Public Road
- Parcel Boundary
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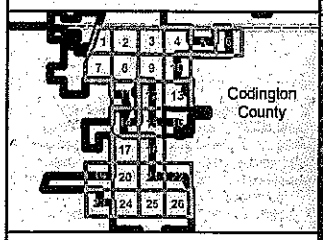
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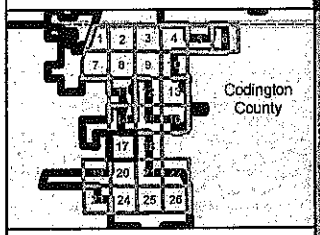
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Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017



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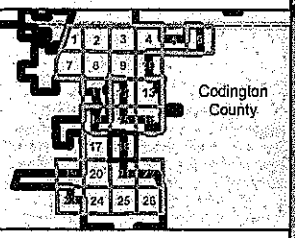
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Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017



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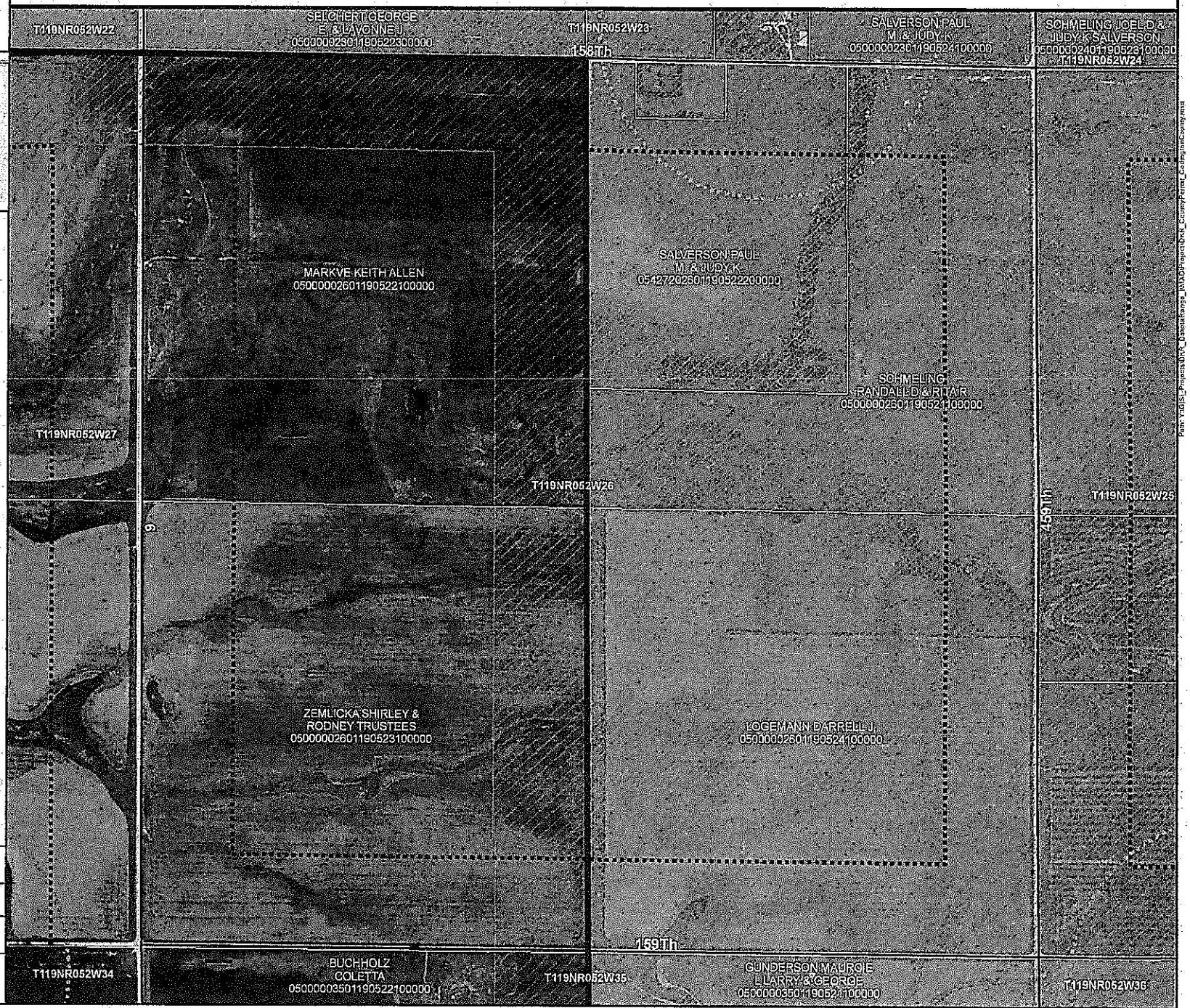
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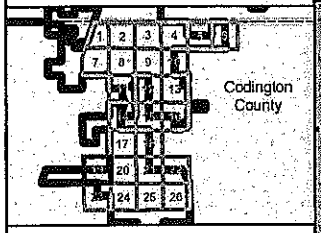
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Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017





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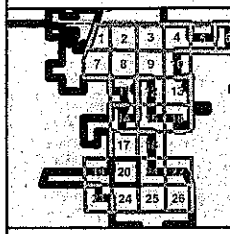
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Site Plan Mapbook: Dakota Range Wind Codington County

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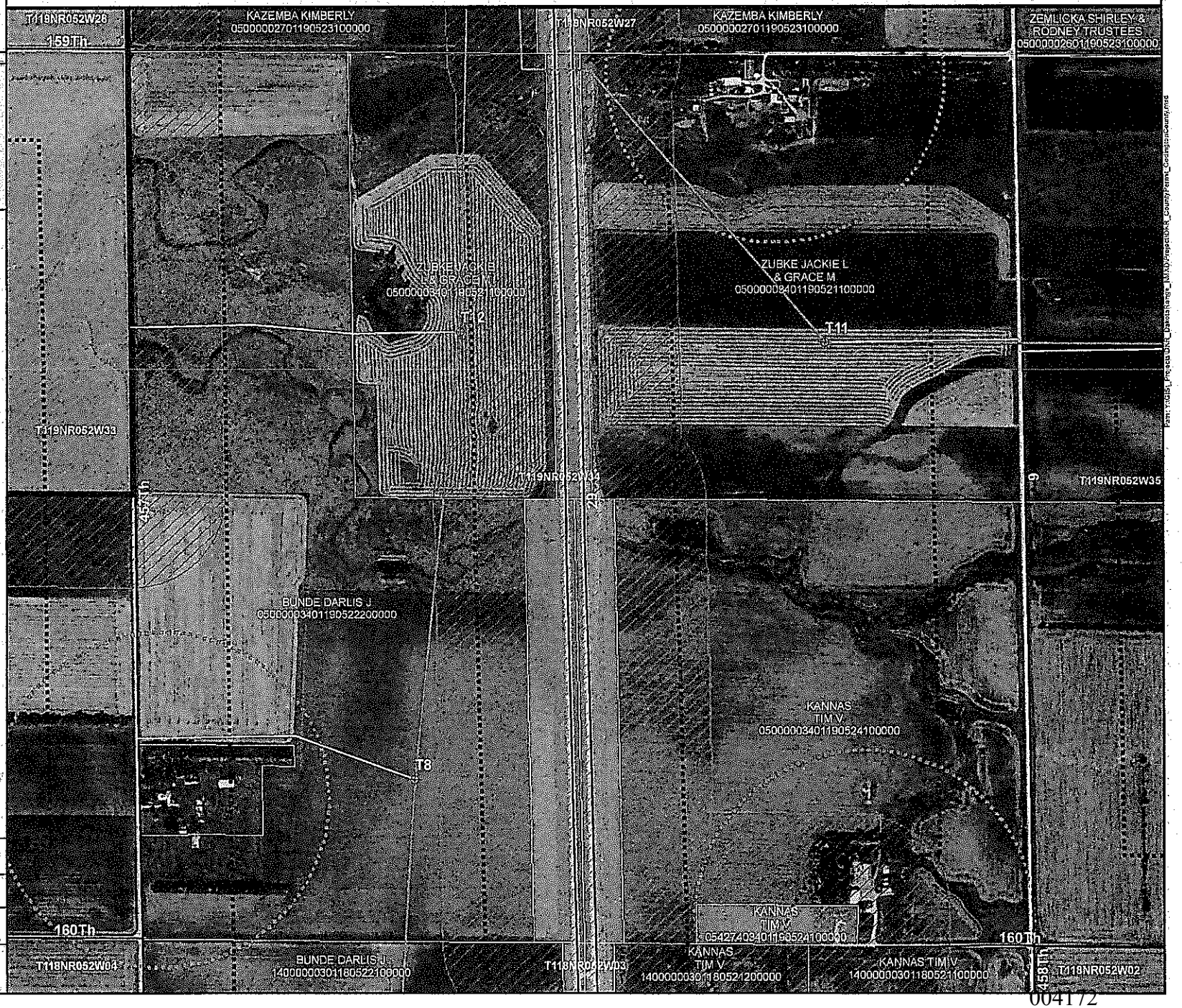
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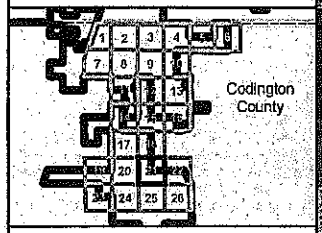
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APEX CLEAN ENERGY



Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017



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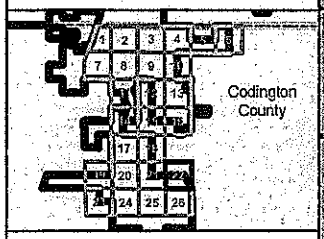
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Site Plan Mapbook: Dakota Range Wind Codington County

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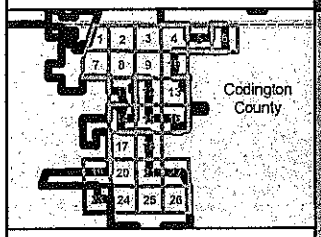
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Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017



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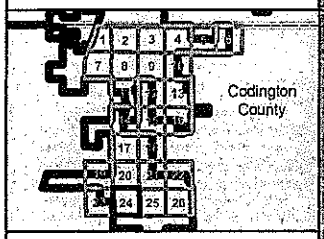
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Site Plan Mapbook: Dakota Range Wind Codington County

Date: 5/2/2017



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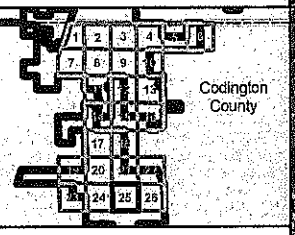
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APEX CLEAN ENERGY

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Site Plan Mapbook: Dakota Range Wind Codington County

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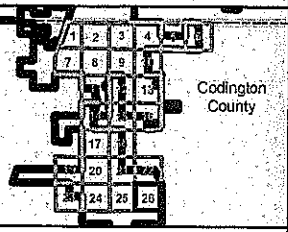
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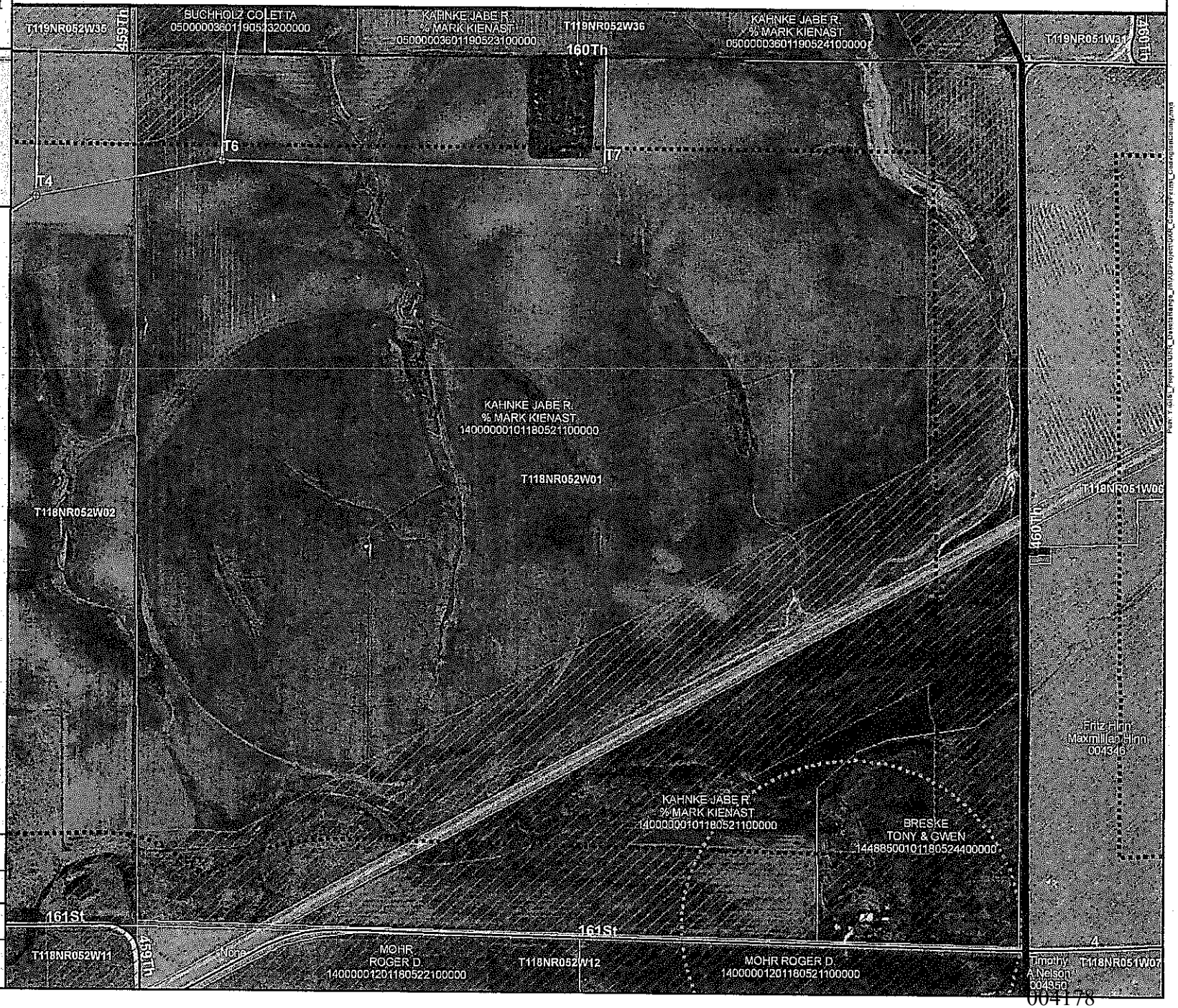
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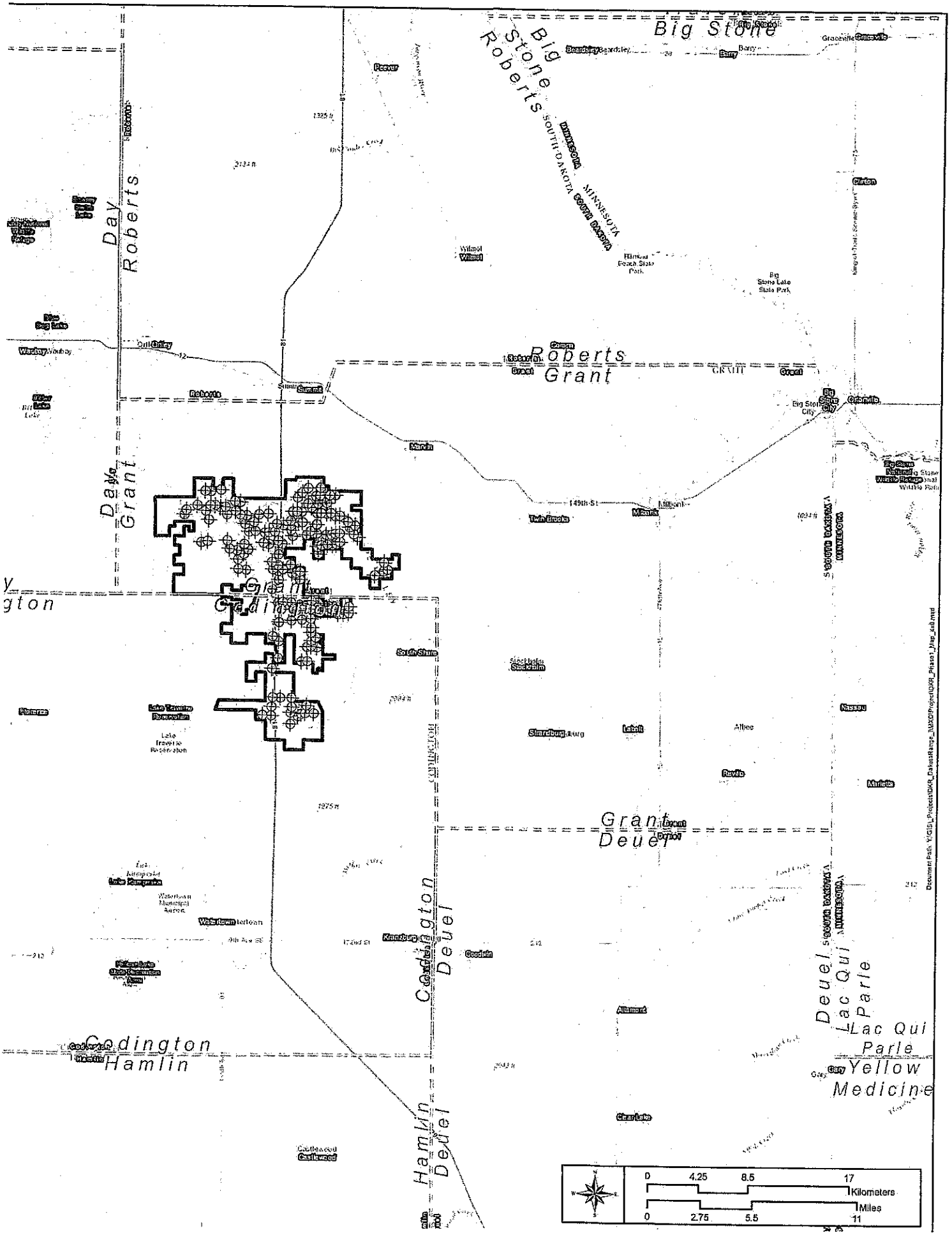
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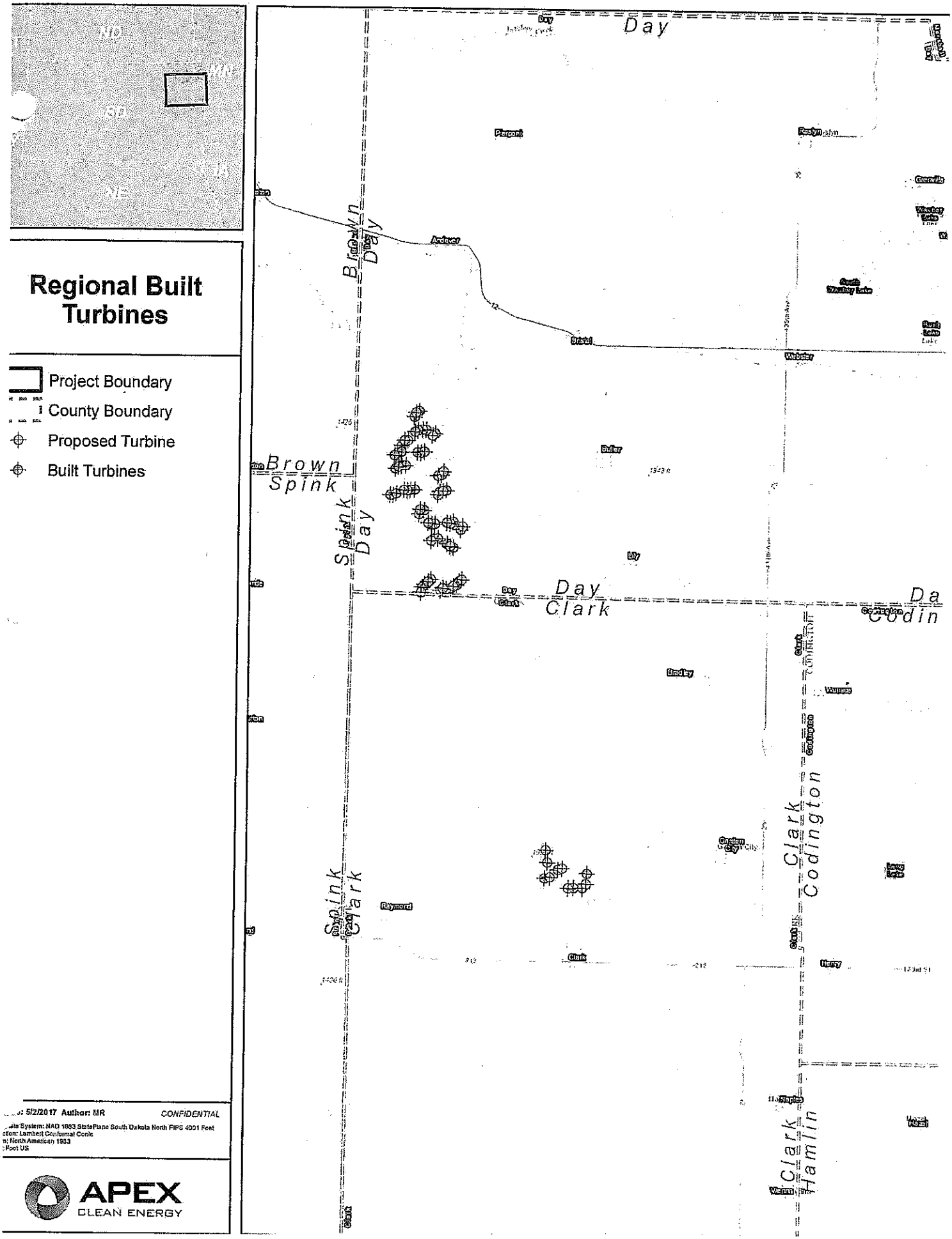
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Big Stone
Roberts
Day
Grant
Codington
Deuel
Hamlin
Lac Qui Parle
Yellow Medicine
SOUTH DAKOTA
MINNESOTA
0 4.25 8.5 17
Kilometers
0 2.75 5.5 11
Miles


Regional Built Turbines
Project Boundary
County Boundary
Proposed Turbine
Built Turbines
Day
Brown
Spink
Clark
Codington
Hamlin
Pierpont
Roslyn
Andover
Bristol
Webster
Butler
Bradley
Garden City
Raymond
Clark
Henry
Vienna
Date: 5/2/2017 Author: MR
CONFIDENTIAL
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Projection: Lambert Conformal Conic
Datum: North American 1983
Units: Foot US
APEX CLEAN ENERGY

Dakota Range

Codington and Grant Counties, South Dakota

Project Schedule
Dakota Range Wind Power Project

A variety of factors influence the timing of the Dakota Range Project Schedule. Below is a best estimate at this time of the schedule. The construction of the project could be delayed or accelerated depending on a number of factors, including permitting, financing, power offtake, turbine supply, and the construction of the Big Stone South-to-Ellendale transmission line that the project will interconnect to. Depending on the resolution of these factors, Dakota Range expects construction to be completed sometime between Q3 2018 and Q4 2019.

January, 2015 – April, 2017: Land leasing
December, 2015 – December 2017: Environmental studies
May, 2017 – June, 2017: Conditional Use Permit
July, 2017 – January, 2018: South Dakota Public Utility Commission Wind Energy Facility Siting Permit
August, 2018 – February, 2018: Pre-construction engineering
February, 2018: Finalize layout; apply for building permits
March, 2018 – September, 2018: Construction

c/o Apex Clean Energy, Inc.
310 4th Street NE, Suite 200 | Charlottesville, VA 22902
T 434.220.7595 | F 434.220.3712
apexcleanenergy.com

Dakota Range

Codington and Grant Counties, South Dakota

To: Conditional Use Permit Application Reviewers

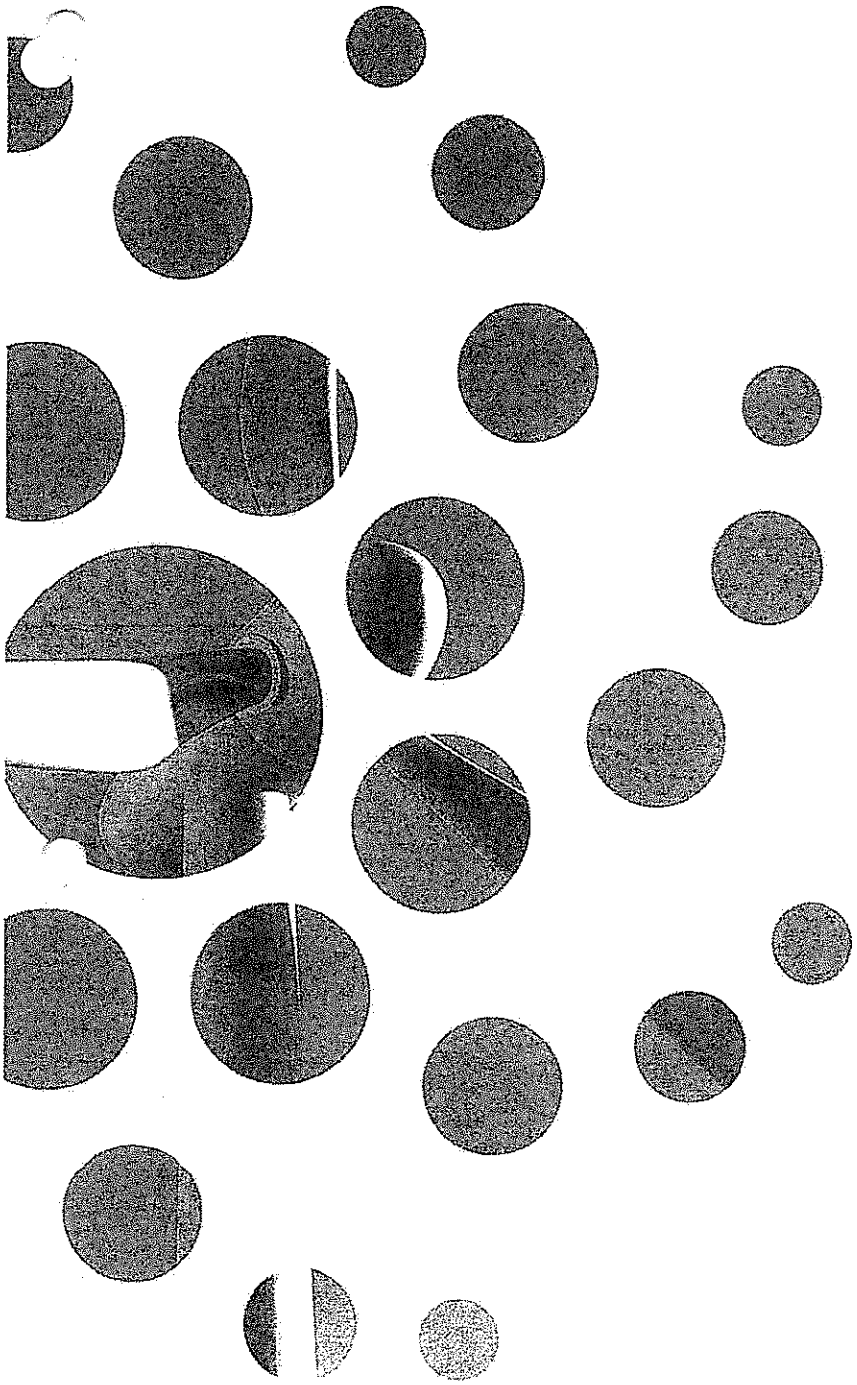
From: Mark Mauersberger, Dakota Range

Date: May 3, 2017

RE: Third Party Reports

The Example Decommissioning Report (Tab 11), the Example Noise Impact Analysis (Tab 12), and the Example Shadow Flicker Analysis (Tab 13), will be provided to the Codington County Planner separately from the May 3 application submission. Dakota Range will provide these documents no later than two weeks before the scheduled Board of Adjustment meeting.

c/o Apex Clean Energy, Inc.
310 4th Street NE, Suite 200 | Charlottesville, VA 22902
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apexcleanenergy.com



AWS TRUEPOWER

PREPARED FOR
APEX CLEAN ENERGY

TURBINE SOUND ANALYSIS

Ref. No.: 17-00671

DAKOTA RANGE I

Codington & Grant Counties
South Dakota

31 May 2017

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Stephanie Van Kempen Lead Renewable Energy Analyst	Jeff Long Senior Renewable Energy Analyst	Katrina Mayba Senior Project Manager

DOCUMENT HISTORY

Issue	Date	Summary
A	31 May 2017	Initial Report

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EXECUTIVE SUMMARY

AWS Truepower, LLC, a UL company, was retained by Apex Clean Energy to evaluate the turbine sound propagation of the proposed Dakota Range I wind project located in Codington and Grant Counties, South Dakota. The layout modeled in this analysis consists of 157 Vestas V110-2.0 MW turbines with a rotor diameter of 110 m and a hub height of 95 m. The turbines will be equipped with blades with the optional serrated trailing edge. This report presents the results of AWS Truepower's analysis and discusses the methods used to develop the turbine sound propagation estimates.

The zoning ordinances for both Codington and Grant Counties outline specific regulations for wind energy conversion systems. The zoning ordinances both specify that the average A-weighted sound pressure level shall not exceed 50 dB(A) at any existing off-site residences. They also specify that turbines shall be setback at least 1,000 feet from any off-site residences, and at least 500 feet from on-site residences. Although this is not specifically in reference to sound, siting turbines a considerable distance from occupied dwellings will help to reduce the impacts of sound.

The turbine sound propagation of the proposed Dakota Range I wind project was estimated using the Openwind software. Openwind was developed by AWS Truepower as an aid for the design, optimization, and assessment of wind power projects. The sound model in Openwind is based on ISO 9613-2, which is the international standard for the attenuation of sound during propagation outdoors. Various site-specific inputs, along with the sound power levels by octave band for the turbine, were input into the software. The octave band–spreading version of the model was used for this study to compare the output to the values in the Codington and Grant County noise regulations.

Total sound propagation was calculated for the proposed Dakota Range I layout. No residence is expected to experience sound levels in excess of the regulation. Noise compliance was also verified along the non-participating property lines; all non-participating property lines are expected to experience sound levels below the allowable limit. All turbines are sited at least 1,000 feet from non-participating residences, and 500 feet from participating residences.

1. INTRODUCTION

AWS Truepower, LLC, a UL company ("AWS Truepower"), was retained by Apex Clean Energy (the "Client") to evaluate the turbine sound propagation of the proposed Dakota Range I wind project located in Codington and Grant Counties, South Dakota. The layout modeled in this analysis consists of 157 Vestas V110-2.0 MW turbines with a rotor diameter of 110 m and a hub height of 95 m. The turbines will be equipped with blades with the optional serrated trailing edge. This report presents the results of AWS Truepower's analysis and discusses the methods used to develop the turbine sound propagation estimates.

2. BACKGROUND

2.1 Sound Perception

The perception of sound at a given point in the vicinity of a wind project is determined by a number of factors. These factors include distance from the source of sound to receptor, surrounding terrain, ambient sound level, time of day, wind direction, temperature gradient, and relative humidity. Sound characteristics such as amplitude (loudness), frequency (pitch), impulse patterns, and duration all affect the potential for sound to be considered noise.

Various filters can be applied to sound meters to account for how the human ear perceives sound. The most commonly used is the A-weighting scale, which accounts for human hearing being more sensitive to sound from mid-level frequencies than sound at low or high frequencies. A-weighting is applied by adding values by octave band to sound levels and is designated with the units dB(A).

2.2 Turbine Sound Emissions

Unlike some early wind turbine designs, sound emissions tend to be less of a concern for modern megawatt-scale wind turbines, especially when those turbines are sited a sufficient distance from dwellings. Aerodynamic sound has been reduced by adjusting the thickness of the blades' trailing edges, by orienting the blades upwind of the turbine tower, and by dramatically reducing the rotor rotation rate. Sound generated by the mechanical components of the turbines has been largely reduced as a result of structure-borne sound insulation of the gearbox and generator. The cooling ducts are also baffled to further reduce sound emissions.

Most turbines begin operating when the wind speed is 3 m/s or greater. Although sound emissions from the turbines tend to increase as the wind speed increases, the ambient sound from the wind tends to be louder than the sound from the turbine at wind speeds above 8–9 m/s. While acceptable distances vary with the number of turbines, ambient background noise, and screening structures and vegetation, a distance of at least 1,000 feet from occupied dwellings is typically used for wind turbine placement.

Figure 2.1 compares the average sound emissions from a typical megawatt-scale wind turbine at a receptor distance of 200 meters relative to other common sounds.

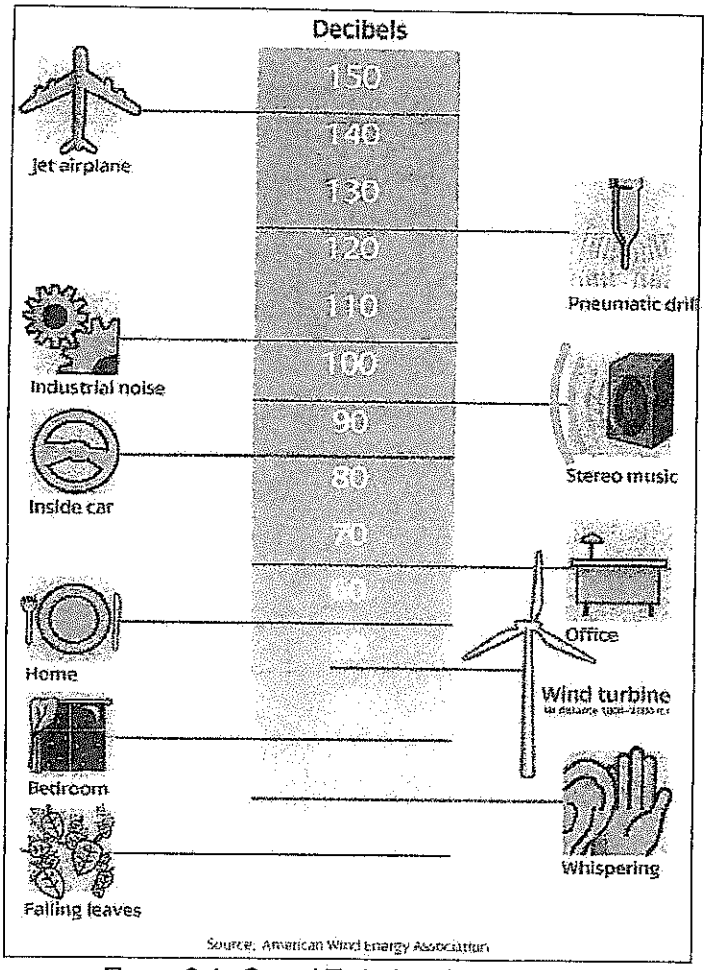


Figure 2.1: Sound Emission Comparisons

3. NOISE REGULATIONS

3.1 Federal Regulations

There are no known federal noise regulations that are applicable to this project.

3.2 State Regulations

There are no known state noise regulations that are applicable to this project.

3.3 County Regulations

Chapter 5, Section 5.22.03 of the Ordinance #65 Zoning Ordinance for Codington County outlines specific regulations for wind energy conversion systems.[3.1] The zoning ordinance specifies that the average A-weighted sound pressure level shall not exceed 50 dB(A) at any existing off-site residence. The zoning ordinance also specifies that turbines shall be setback at least 1,000 feet from any off-site

[3.1] Ordinance #65 Zoning Ordinance for Codington County, Chapter 5, Section 5.22.03, Item 12

residence, and at least 500 feet from on-site residences. Although this is not specifically in reference to sound, siting turbines a considerable distance from occupied dwellings will help to reduce the impacts of sound. All turbines within Codington County are sited at least 1,000 feet from non-participating residences, and 500 feet from participating residences.

Article XII, Section 1211.04 of the Zoning Ordinance for Grant County outlines specific regulations for wind energy conversion systems.[3.2] The zoning ordinance specifies that the average A-weighted sound pressure level shall not exceed 50 dB(A) at any existing off-site residence. The zoning ordinance also specifies that turbines shall be setback at least 1,000 feet from any off-site residence, and at least 500 feet from on-site residences. Although this is not specifically in reference to sound, siting turbines a considerable distance from occupied dwellings will help to reduce the impacts of sound. All turbines within Grant County are sited at least 1,000 feet from non-participating residences, and 500 feet from participating residences.

4. METHODOLOGY

The turbine sound propagation of the proposed Dakota Range I wind project was estimated using the Openwind software. Openwind was developed by AWS Truepower as an aid for the design, optimization, and assessment of wind power projects.[4.3] The sound model in Openwind is based on ISO 9613-2, which is the international standard for the attenuation of sound during propagation outdoors.[4.4] Under this standard, all sound sources are treated as point sources, all sound propagation is assumed to be in the same direction as the wind, all atmospheric conditions are to be favorable to sound propagation, and all wind speeds that are between 3 and 11 meters above ground level are assumed to be between 1 and 5 m/s.

There are several types of attenuation, or decrease of the intensity of sound energy, considered in ISO 9613-2 and incorporated into the model within Openwind:

- Atmospheric—This is the conversion of sound energy into heat.
- Geometric Spreading—As the hemisphere of sound travels outwards from its point source, the sound energy is spread out over an area proportional to the distance squared.
- Ground Effect—Soft or porous ground (e.g. soil, vegetation) tends to absorb sound energy, whereas hard ground (e.g. concrete, ice, water, tamped earth) tends to reflect sound back upwards towards the observer.

The atmospheric attenuation coefficients are calculated using equations from ISO 9613-1 and the site relative humidity, temperature, and air density. Using data from a nearby reference station, a relative humidity of 76.2%, a temperature of 6.7° C, and an air density of 1.162 kg/m^3 were calculated for the site.

[3.2] Zoning Ordinance for Grant County, Article XII, Section 1211.04, Item 13; effective 25 May 2004

[4.3] "Openwind – Theoretical Basis and Validation," Version 1.3, AWS Truewind, LLC, April 2010.

[4.4] International Standard, ISO 9613-2, First edition, – Reference Number: ISO9613-2:1996(E) – 15 Dec 1996.

The observer height and ground porosity are both factors in calculating attenuation due to ground effect. An observer height of 1.75 m was used in this analysis, representing the height of an average to tall person. The ground porosity for the site was estimated for a distance of 5,000 m around the turbine locations using land classifications from the National Land Cover Database 2011. The percent of the area considered to be soft ground was calculated as 95%; therefore, a ground porosity of 0.95 was used in this analysis.

Additional inputs to the model included the turbine locations and receptor locations. The turbine layout used in this analysis consists of 157 Vestas V110-2.0 MW turbines at a hub height of 95 m. The layout was provided by the Client on 09 May 2017.[4.5] Coordinates for the turbines are presented in Table 6.1 of Appendix A. There were two sets of receptors provided by the Client for the analysis: participating residences and non-participating residences. The Client also provided data for the non-participating parcels. It is recommended that the locations of both sets of receptors are verified by a site visit, if they haven't been already.

The octave band–spreading version of the model was used for this study. In this model, turbine sound power levels by octave band are used to calculate attenuation separately for each octave band before combining the octave band sound pressure levels at the receptor. The total sound power level and A-weighted total sound power level by one-third octave bands for the Vestas V110-2.0 MW turbine, with optional serrated trailing edge, were taken from manufacturer specifications provided by the Client on 18 May 2017.[4.6] The one-third octave band sound power levels were converted to octave band sound power levels and are presented in Table 4.1.

[4.5] Layout Version: DKR_LAY_022

[4.6] Document Version: 0051-2907_04 dated 28 April 2016

Table 4.1: A-Weighted Sound Power Levels by Hub Height Wind Speed and Octave Band for the Vestas V110-2.0 MW Turbine

	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s
31.5 Hz	65.9	64.4	64.1	69.4	70.7	73.6	76.1	77.2	78.2
63 Hz	78.7	77.7	77.5	81.5	82.5	84.7	86.7	87.5	88.2
125 Hz	83.1	83.7	84.8	88.5	90.1	92.3	93.6	93.4	93.3
250 Hz	87.4	88.8	90.4	93.3	95.1	96.9	97.8	96.9	96.3
500 Hz	89.0	90.1	91.6	94.8	96.6	98.6	99.7	99.0	98.6
1 kHz	88.4	88.1	88.7	93.5	95.1	97.8	99.8	100.2	100.5
2 kHz	88.7	88.7	89.4	93.7	95.3	97.7	99.5	99.8	100.0
4 kHz	85.4	85.0	85.4	89.8	91.2	93.6	95.5	95.9	96.2
8 kHz	70.3	70.2	70.9	75.3	76.9	79.3	81.1	81.3	81.5
Total [dB(A)]	95.3	95.8	96.9	100.7	102.3	104.5	106	106	106
	12 m/s	13 m/s	14 m/s	15 m/s	16 m/s	17 m/s	18 m/s	19 m/s	20 m/s
31.5 Hz	78.8	79.4	79.8	80.2	80.5	80.8	81.0	81.3	81.5
63 Hz	88.6	89.0	89.3	89.6	89.8	90.0	90.2	90.4	90.5
125 Hz	93.1	93.1	92.9	92.8	92.7	92.6	92.6	92.5	92.3
250 Hz	95.8	95.5	95.2	94.8	94.5	94.2	94.0	93.8	93.5
500 Hz	98.2	98.0	97.7	97.5	97.3	97.0	96.9	96.7	96.5
1 kHz	100.6	100.8	100.9	101.0	101.0	101.1	101.1	101.2	101.2
2 kHz	100.1	100.3	100.3	100.4	100.4	100.5	100.5	100.6	100.6
4 kHz	96.4	96.7	96.8	96.9	96.9	97.0	97.1	97.1	97.1
8 kHz	81.5	81.6	81.7	81.7	81.7	81.7	81.7	81.8	81.7
Total [dB(A)]	106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0

5. RESULTS

Given the sound model inputs specified above, total sound propagation was calculated for the proposed Dakota Range I layout. Figure 6.1 in Appendix A presents the total sound pressure level in the vicinity of the turbine locations at 15 m/s, which is among the wind speeds with the highest output; not all of the receptor locations are visible on the map. The total sound pressure level at each of the participating residences can be found in Table 6.2, while the total sound pressure level at each of the non-participating residences can be found in Table 6.3. No residence is expected to experience sound levels in excess of the regulation for either county. Noise compliance was also verified along the property lines. All property lines are expected to experience sound levels below the allowable limit.

The sound modeling results represent a conservative estimate of the actual sound levels that may be experienced at receptor locations near the project site due to the following conditions:

- The sound model is designed mainly for use in flat or constantly sloping terrain. Terrain data is only used to calculate 3-dimensional distances between source and receiver. The model does not take into account the fact that terrain features such as hills can act as barriers to the propagation of sound.
- Other obstacles to the propagation of sound such as trees and buildings are also ignored.

- Ambient sound, such as the rustling of leaves, which tends to mask turbine sounds at higher wind speeds, is ignored.

On-site measurement is recommended to account for site-specific variables and conditions like ground porosity and locations of receptors. In the unlikely event that on-site measurement yields non-compliance once the project is operational, reductions of sound levels can be achieved by altering the turbine operating parameters used at the site. Many turbine models, including the Vestas V110-2.0 MW, offer reduced sound output modes that can be used for certain turbine locations and during certain times of day.

6. APPENDIX A—VESTAS V110-2.0 MW RESULTS

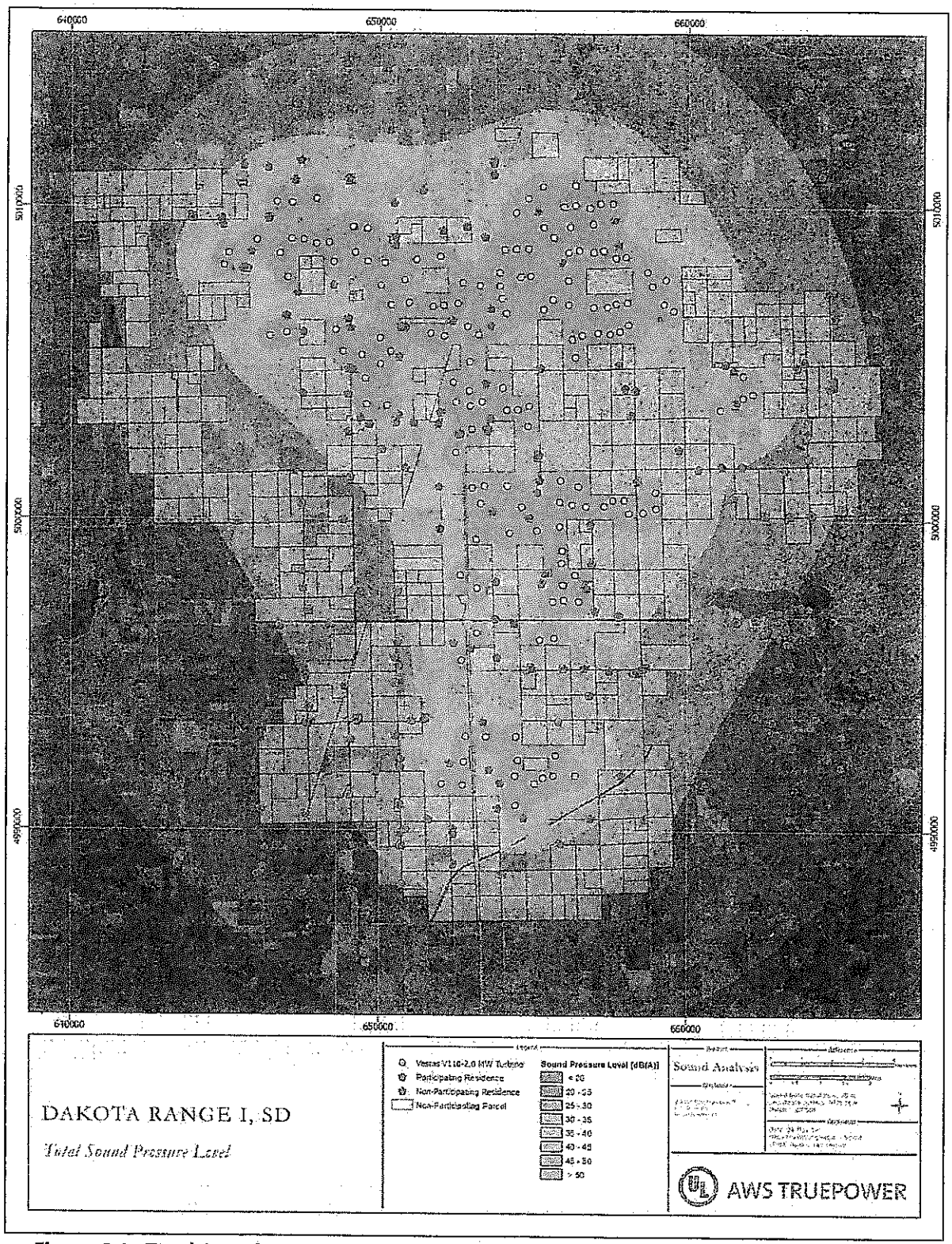


Figure 6.1: Total Sound Pressure Level for the Dakota Range I—Vestas V110-2.0 MW Layout

Table 6.1: Dakota Range I Turbine Layout Coordinates

Turbine ID	Easting	Northing
T1	654437	4990818
T2	652744	4991457
T3	655041	4991504
T4	655320	4991691
T5	654417	4991753
T6	655655	4991763
T7	656351	4991767
T8	652772	4992208
T9	654509	4992272
T10	655721	4992419
T11	653496	4993021
T12	652836	4993026
T13	654445	4993035
T14	655196	4996147
T15	655666	4996204
T16	653194	4996356
T17	656446	4997379
T18	655629	4997383
T19	655975	4997421
T20	653188	4997799
T21	655951	4997909
T22	652656	4998211
T23	656328	4998223
T24	655904	4998613
T25	655918	4999018
T26	653176	4999371
T27	654239	4999575
T28	655096	4999662
T29	655845	4999788
T30	658112	5000221
T31	658571	5000246
T32	658986	5000374
T33	654618	5000416
T34	656684	5000431
T35	657273	5000452
T36	656230	5000489
T37	653317	5000510
T38	655840	5000580
T39	657586	5000632
T40	657966	5000649
T41	658975	5000894
T42	653043	5001014
T43	656441	5001077
T44	654160	5001084
T45	653434	5001084
T46	655861	5001267
T47	653017	5002903
T48	654805	5002994
T49	654133	5003520
T50	654486	5003526
T51	661070	5003538
T52	652951	5003633
T53	654837	5003644

Table 6.1: Dakota Range I Turbine Layout Coordinates

Turbine ID	Easting	Northing
T54	650236	5003652
T55	649568	5003692
T56	652494	5003760
T57	653350	5003784
T58	661820	5003921
T59	662143	5004047
T60	652929	5004123
T61	654001	5004223
T62	652407	5004389
T63	649539	5004505
T64	661822	5004632
T65	650022	5004973
T66	652946	5005057
T67	656327	5005195
T68	649412	5005254
T69	648810	5005368
T70	650353	5005382
T71	656226	5005775
T72	650010	5005792
T73	652107	5005873
T74	656538	5005899
T75	653232	5005916
T76	651651	5005951
T77	657462	5005957
T78	657062	5005987
T79	657792	5006040
T80	648574	5006041
T81	652869	5006175
T82	658085	5006247
T83	654108	5006602
T84	659536	5006690
T85	655288	5006741
T86	656908	5006794
T87	651726	5006804
T88	657364	5006812
T89	652084	5006846
T90	650375	5006856
T91	656106	5006880
T92	659223	5006900
T93	652556	5006911
T94	657670	5006917
T95	650951	5006932
T96	658042	5006958
T97	655606	5007049
T98	653977	5007075
T99	658846	5007474
T100	653908	5007477
T101	650039	5007482
T102	653280	5007490
T103	652715	5007567
T104	650808	5007652
T105	656089	5007654
T106	659289	5007676

Table 6.1: Dakota Range I Turbine Layout Coordinates

Turbine ID	Easting	Northing
T107	647010	5007728
T108	654563	5007759
T109	654877	5007787
T110	653901	5007895
T111	658684	5007931
T112	650166	5008209
T113	648494	5008227
T114	649609	5008256
T115	651198	5008310
T116	657659	5008385
T117	657992	5008416
T118	651981	5008419
T119	646755	5008498
T120	649198	5008542
T121	656102	5008559
T122	656918	5008574
T123	656449	5008620
T124	657239	5008625
T125	654062	5008649
T126	654818	5008668
T127	654425	5008672
T128	647921	5008811
T129	648345	5008844
T130	646023	5008935
T131	647526	5008948
T132	647122	5008962
T133	655630	5009033
T134	649591	5009297
T135	649130	5009361
T136	655296	5009363
T137	656148	5009371
T138	656888	5009470
T139	654407	5009826
T140	656776	5009978
T141	655947	5010011
T142	656318	5010061
T143	657557	5010121
T144	657123	5010123
T145	647137	5010125
T146	646649	5010148
T147	647928	5010260
T148	654805	5010277
T149	655270	5010661
T150	656318	5010703
T151	652048	4991488
T152	652689	4995485
T153	652485	5002146
T154	646437	5005858
T155	646967	5005964
T156	644953	5008122
T157	645110	5008515

Note: Coordinates are in WGS84 UTM14N

Table 6.2: Total Sound Pressure Level [dB(A)] at Participating Residences —Vestas V110-2.0 MW Layout

Residence ID	Easting	Northing	Total Sound Pressure Level
20	654682	4990406	39.3
26	656835	4990400	31.4
105	665082	4993093	22.8
146	653951	4991544	40.4
156	653588	4991975	38.8
161	652432	4989894	30.8
209	650707	4992321	30.4
222	652311	4992164	40.9
232	653395	4993505	39.9
398	663380	4996039	25.2
500	656622	4995250	32.7
592	648375	4996645	27.1
656	650473	4996848	29.5
675	649341	4999050	29.0
689	651994	4999721	34.5
723	655254	4997957	40.2
789	648160	5000058	28.6
843	655103	5000902	40.1
848	654852	5000076	43.3
851	653693	5000273	41.9
863	644357	5002651	27.1
880	647235	5001567	28.9
906	650524	5003104	37.9
910	651108	5003102	35.8
917	651910	5003058	37.9
929	652661	5002766	42.8
930	652602	5002742	42.0
951	661784	5001742	30.5
954	661127	5001722	31.2
970	664756	5004487	27.4
1003	653600	5003245	42.4
1006	653457	5004344	42.9
1015	651979	5003440	39.7
1016	651998	5003451	39.9
1019	650606	5003348	39.7
1030	649364	5003248	39.6
1085	649046	5006118	41.2
1101	647304	5007251	38.8
1110	648481	5007490	38.2
1133	650627	5005202	43.7
1135	661518	5004784	42.3
1141	661600	5003749	44.8
1157	649872	4991904	27.9
1158	649922	4991918	28.0
1181	652367	5006353	44.0
1183	653594	5006201	42.5
1235	653613	5006756	43.3
1259	664924	5006726	26.5

Table 6.2: Total Sound Pressure Level [dB(A)] at Participating Residences —Vestas V110-2.0 MW Layout

Residence ID	Easting	Northing	Total Sound Pressure Level
1260	665844	5006677	25.5
1261	665811	5006676	25.5
1278	665811	5006676	25.5
1279	665811	5006676	25.5
1294	661511	5009230	29.7
1312	657735	5008810	44.1
1316	657619	5009595	42.0
1321	655865	5008248	43.8
1335	653412	5009060	38.8
1336	653437	5009051	38.9
1402	645841	5008575	41.9
1414	645631	5008057	39.2
1415	645560	5008023	39.5
1425	644921	5009426	35.2
1435	647229	5010860	37.7
1446	650458	5010136	34.8
1447	651400	5010537	32.8
1454	653709	5011042	34.6
1463	655074	5009887	43.4
1473	663067	5009863	27.2
1512	645592	5011331	31.1
1525	653707	5011413	33.5
1526	653707	5011446	33.4
1527	653705	5011489	33.2
1537	659888	5013103	27.8
1540	656697	5014471	27.9
1543	657521	5013443	29.1
1546	657918	5013363	29.0
1549	654214	5014599	27.8
1552	653464	5014791	27.4
1553	653470	5014748	27.5
1569	654441	5017765	24.5
1572	650616	5013442	28.4
1593	648988	5013202	28.6
1609	647139	5014024	27.0
1640	646112	5014302	26.2
1641	650228	5014435	27.2
1648	648858	5014749	26.6
1658	647098	5014730	26.1
1664	645511	5015039	25.1
1665	645500	5015040	25.1
1666	645488	5015042	25.1
1667	645476	5015042	25.1
1689	647399	5015987	25.0
1698	651813	5014591	27.4
1699	651778	5014579	27.4
1700	651881	5014455	27.5
1704	660721	5013272	26.9
1711	660611	5014484	25.9
1712	660716	5014630	25.7
1715	659630	5014923	26.1

Table 6.2: Total Sound Pressure Level [dB(A)] at Participating Residences —Vestas V110-2.0 MW Layout

Residence ID	Easting	Northing	Total Sound Pressure Level
1725	646222	5016509	24.2
1738	647225	5016639	24.4
1761	647898	5017254	24.1
1768	652439	5016206	25.8
1770	662657	5015411	24.0
1792	663811	5014304	24.0
1813	660406	5016495	24.3
1815	659371	5017345	24.1
1816	659533	5018317	23.3
1875	655281	5020979	22.1
1876	655229	5021036	22.0
1946	652007	5018429	23.9
1982	646631	5018928	22.6
1993	644599	5020890	20.8
2001	644610	5020921	20.8
2003	645451	5022016	20.4
2008	650430	5020350	22.3
2009	651846	5019969	22.7
2015	653454	5019125	23.4
2017	653879	5019205	23.4
2018	653893	5019481	23.2
2019	654051	5019610	23.1
2020	654294	5019608	23.1
2033	657346	5024816	19.6
2040	656611	5026995	18.5
2075	648291	5024622	19.5
2084	652138	5021042	22.0
2091	651774	5022027	21.4
2097	650244	5022881	20.7
2114	646174	5024200	19.4
2121	645347	5024827	18.9
2143	653402	5022226	21.3
2144	653676	5022816	20.9
2233	640496	5026596	17.1
2236	640622	5026118	17.3
2261	639687	5025191	17.4
2303	648352	4991903	25.5
2351	651938	5001067	35.6
2407	643160	5007930	29.4

Note: Coordinates are in WGS84 UTM14N

Table 6.3: Total Sound Pressure Level [dB(A)] at Non-Participating Residences —Vestas V110-2.0 MW Layout

Residence ID	Easting	Northing	Total Sound Pressure Level
3	650712	4988266	25.1
6	650731	4988249	25.1
7	652416	4988919	27.7
13	654015	4988590	27.8
21	655847	4989588	30.3
35	657862	4991817	30.4
37	659447	4992233	26.8
38	659433	4992153	26.8
58	660141	4991656	25.7
68	660636	4991546	25.2
88	663565	4991347	23.0
89	665046	4992088	22.5
92	666762	4991802	21.4
109	664242	4993659	23.6
129	662819	4993516	24.5
136	662251	4993738	25.0
144	653858	4990720	38.2
162	652414	4990051	31.6
173	651609	4990365	31.6
181	650704	4989527	27.0
184	650662	4989915	27.6
185	650857	4990054	28.4
200	650658	4990853	29.6
208	650693	4992058	30.5
246	655804	4993536	34.0
249	656798	4994383	31.0
255	657465	4995164	30.7
270	658362	4995128	29.3
271	658579	4995244	29.2
284	660999	4995203	26.7
285	660903	4995173	26.7
294	663415	4995388	24.9
295	662991	4995236	25.1
302	665798	4995300	23.2
309	663991	4997186	25.2
310	663745	4997206	25.4
311	663744	4997244	25.4
314	663484	4997238	25.6
315	663431	4997226	25.7
316	663419	4997187	25.7
317	663395	4997160	25.7
318	663375	4997146	25.7
319	663273	4997064	25.7
320	663389	4996957	25.6
321	663323	4996965	25.6
322	663293	4996959	25.7
323	663273	4996826	25.6
324	663248	4996819	25.6
325	663229	4996823	25.6
326	663204	4996818	25.7
327	663258	4996949	25.7

Table 6.3: Total Sound Pressure Level [dB(A)] at Non-Participating Residences —Vestas V110-2.0 MW Layout

Residence ID	Easting	Northing	Total Sound Pressure Level
328	663219	4996939	25.7
329	663169	4996762	25.7
330	663136	4996763	25.7
331	663120	4996761	25.7
332	663108	4996722	25.7
333	663218	4996750	25.6
334	663292	4996645	25.5
335	663261	4996643	25.5
336	663230	4996642	25.6
337	663208	4996633	25.6
338	663169	4996633	25.6
339	663111	4996636	25.7
340	663108	4996621	25.7
341	663066	4996632	25.7
342	663259	4996492	25.5
343	663211	4996562	25.5
344	663176	4996555	25.6
345	663174	4996500	25.5
346	663176	4996460	25.5
347	663124	4996507	25.6
348	663112	4996551	25.6
349	663140	4996554	25.6
350	663067	4996579	25.7
351	663046	4996547	25.7
352	663060	4996472	25.6
353	662996	4996410	25.6
354	662991	4996458	25.7
355	662994	4996500	25.7
356	662986	4996551	25.7
357	662983	4996576	25.7
358	662984	4996590	25.7
359	662982	4996613	25.8
360	662980	4996638	25.8
361	662981	4996676	25.8
362	663007	4996673	25.8
363	663060	4996680	25.7
364	662982	4996706	25.8
365	662981	4996737	25.8
366	662980	4996755	25.8
367	662979	4996765	25.8
368	663012	4996771	25.8
369	663013	4996755	25.8
370	663058	4996754	25.8
371	663063	4996726	25.7
372	662929	4996717	25.8
373	662926	4996734	25.9
374	662930	4996677	25.8
375	662911	4996757	25.9
376	662916	4996622	25.8
377	662917	4996590	25.8
378	662917	4996541	25.8

Table 6.3: Total Sound Pressure Level [dB(A)] at Non-Participating Residences —Vestas V110-2.0 MW Layout

Residence ID	Easting	Northing	Total Sound Pressure Level
379	662898	4996539	25.8
380	662863	4996545	25.8
381	662935	4996479	25.7
382	662934	4996459	25.7
383	662932	4996434	25.7
384	662934	4996405	25.7
385	662931	4996502	25.7
386	662932	4996348	25.7
387	662800	4996400	25.8
388	662822	4996402	25.8
389	662732	4996399	25.9
390	662813	4996444	25.8
391	662811	4996488	25.8
392	662851	4996476	25.8
393	663278	4996054	25.3
399	663010	4996268	25.6
400	663018	4996232	25.5
410	662508	4996371	26.0
411	662675	4996565	26.0
412	662669	4996623	26.0
413	662668	4996732	26.1
414	662715	4996674	26.0
415	662713	4996727	26.0
416	662731	4996746	26.0
417	662789	4996742	26.0
418	662789	4996686	25.9
419	662850	4996690	25.9
420	662847	4996722	25.9
421	662845	4996748	25.9
422	662875	4996761	25.9
423	662848	4996667	25.9
424	662739	4996872	26.1
425	662789	4996854	26.0
426	662844	4996850	26.0
427	662853	4996812	26.0
428	662932	4996804	25.9
429	662929	4996822	25.9
430	662973	4996814	25.9
431	662997	4996813	25.8
432	663053	4996848	25.8
433	663061	4996871	25.8
434	663056	4996905	25.8
435	663126	4996818	25.7
436	663144	4996897	25.8
471	662669	4997061	26.2
472	662697	4997062	26.2
473	662752	4997054	26.2
474	662796	4997057	26.1
475	662842	4997048	26.1
483	663076	4997051	25.9
484	663024	4997055	25.9

Table 6.3: Total Sound Pressure Level [dB(A)] at Non-Participating Residences —Vestas V110-2.0 MW Layout

Residence ID	Easting	Northing	Total Sound Pressure Level
485	662971	4997031	26.0
486	663019	4997036	25.9
487	662283	4996825	26.4
488	662240	4996823	26.5
494	661651	4996767	27.0
495	661619	4996758	27.0
513	655955	4995240	34.5
523	654917	4995237	34.6
531	653838	4995578	34.5
534	652996	4995886	40.8
535	652437	4996048	37.8
541	650593	4996054	29.5
542	650496	4995587	29.2
545	650637	4995303	29.4
579	650502	4994754	29.0
586	648862	4994650	26.9
628	647648	4997080	26.7
636	647523	4997800	26.9
644	649155	4997753	28.2
662	650596	4997697	30.1
671	647489	4998353	27.1
701	653787	4998023	37.8
706	653778	4996826	36.6
713	654385	4996688	35.7
724	655369	4998297	40.7
733	656685	4997836	42.3
738	656977	4997093	38.6
749	656868	4998570	39.3
753	657770	4996904	33.0
754	657793	4996940	33.0
758	656816	4999863	41.1
762	663163	4998857	26.7
766	663292	4998945	26.6
768	662735	4999393	27.4
770	663358	5000159	27.1
771	663387	5000154	27.1
774	664063	5000216	26.4
775	664074	5000199	26.4
780	647461	5000525	28.3
781	647456	5000456	28.3
803	648809	4999992	29.1
806	649064	5001386	30.6
808	663179	5001621	28.4
819	662551	5000165	28.0
823	661543	5000761	29.8
828	660362	5001638	32.3
835	658372	5001257	39.7
837	655170	5001262	39.3
857	645387	4999932	26.4
858	646345	4999960	27.1
890	648970	5002809	34.1

Table 6.3: Total Sound Pressure Level [dB(A)] at Non-Participating Residences —Vestas V110-2.0 MW Layout

Residence ID	Easting	Northing	Total Sound Pressure Level
897	649665	5003051	38.1
907	650075	5002249	33.4
920	650833	5001658	33.0
932	653531	5002925	41.4
934	653518	5002857	41.2
939	667072	5000419	23.9
948	665253	5001243	25.7
950	665545	5000338	25.1
958	663970	5002020	27.7
964	666497	5005153	25.0
971	664644	5004251	27.6
974	663576	5004902	30.4
981	657975	5004221	34.1
993	658165	5003370	32.7
997	655166	5002087	36.9
1044	648978	5004009	39.0
1048	647494	5004033	32.7
1057	647511	5006002	39.0
1078	648977	5004832	41.6
1080	649090	5004809	42.1
1091	648970	5006430	39.6
1093	646969	5006521	39.1
1120	650685	5006150	40.7
1121	650838	5006169	40.5
1124	650686	5006188	40.8
1136	661243	5005003	36.6
1150	659717	5002264	32.5
1152	658319	5004153	33.5
1154	650528	4993062	29.3
1174	646887	4994910	25.3
1180	646744	4996588	25.8
1200	667698	5004863	23.9
1211	666221	5005552	25.3
1214	664806	5006460	26.7
1222	663797	5005086	29.4
1229	657770	5004970	37.4
1234	655202	5004866	36.7
1251	664537	5007281	26.7
1350	652821	5009387	36.1
1366	652045	5009239	36.9
1382	650503	5009034	38.5
1399	650494	5008777	39.9
1412	645709	5008004	38.5
1413	645721	5008021	38.5
1431	646375	5009625	40.1
1439	648982	5010915	34.1
1445	648974	5010823	34.5
1475	664388	5011012	25.3
1484	665390	5009888	24.9
1513	646356	5011254	33.4
1523	647415	5011482	33.3

Table 6.3: Total Sound Pressure Level [dB(A)] at Non-Participating Residences —Vestas V110-2.0 MW Layout

Residence ID	Easting	Northing	Total Sound Pressure Level
1567	654426	5017892	24.4
1568	654209	5017869	24.5
1594	647291	5013274	28.1
1647	648895	5014568	26.8
1676	644633	5014491	25.2
1723	643999	5016084	23.6
1724	643978	5016340	23.4
1771	663759	5015440	23.4
1772	663622	5013709	24.5
1773	663500	5014120	24.3
1774	663525	5014112	24.3
1775	663712	5014003	24.2
1776	663747	5014077	24.2
1777	663802	5013975	24.2
1778	663844	5013978	24.2
1779	663994	5013843	24.2
1780	663998	5013883	24.1
1781	663994	5013905	24.1
1782	663956	5013925	24.1
1783	663960	5013999	24.1
1784	663956	5014028	24.1
1785	663809	5014059	24.1
1786	663745	5014061	24.2
1787	663822	5014118	24.1
1788	663844	5014118	24.1
1789	663938	5014040	24.1
1790	663994	5014032	24.0
1791	663991	5013958	24.1
1793	663761	5014298	24.0
1794	663763	5014263	24.1
1795	663649	5014196	24.2
1796	663574	5014325	24.1
1812	663600	5014179	24.2
1817	662958	5019757	21.3
1818	662287	5020608	21.0
1834	662687	5022843	19.7
1835	662695	5022980	19.6
1836	662371	5022974	19.7
1867	661641	5022645	20.1
1868	659804	5022129	20.7
1878	654009	5018004	24.3
1879	653948	5018047	24.3
1880	653727	5018884	23.6
1881	653645	5018765	23.7
1882	653647	5018716	23.8
1883	653686	5018751	23.7
1884	653727	5018733	23.7
1885	653733	5018804	23.7
1886	653775	5018821	23.7
1887	653779	5018775	23.7
1888	653796	5018756	23.7

Table 6.3: Total Sound Pressure Level [dB(A)] at Non-Participating Residences —Vestas V110-2.0 MW Layout

Residence ID	Easting	Northing	Total Sound Pressure Level
1889	653812	5018730	23.7
1890	653790	5018684	23.8
1891	653802	5018650	23.8
1892	653830	5018655	23.8
1893	653872	5018648	23.8
1894	653825	5018767	23.7
1895	653822	5018838	23.7
1896	653773	5018844	23.7
1897	653730	5018838	23.7
1898	654082	5018861	23.6
1899	654098	5018819	23.7
1900	654051	5018820	23.7
1901	654061	5018782	23.7
1902	654100	5018784	23.7
1903	654099	5018738	23.7
1904	654059	5018740	23.7
1905	654135	5018785	23.7
1906	654136	5018745	23.7
1907	654104	5018657	23.8
1908	654055	5018682	23.8
1909	654011	5018693	23.8
1910	654193	5018864	23.6
1911	654247	5018830	23.7
1912	654284	5018758	23.7
1913	654238	5018696	23.8
1914	654160	5018557	23.9
1915	654118	5018592	23.9
1916	654088	5018586	23.9
1917	654097	5018547	23.9
1918	654076	5018498	23.9
1919	654076	5018466	24.0
1920	654168	5018459	24.0
1921	654156	5018498	23.9
1922	654013	5018455	24.0
1923	653987	5018446	24.0
1924	653980	5018480	23.9
1925	653975	5018569	23.9
1926	653934	5018492	23.9
1927	653877	5018493	23.9
1928	653881	5018544	23.9
1929	653833	5018607	23.8
1930	653790	5018605	23.8
1931	653790	5018572	23.9
1932	653786	5018530	23.9
1933	653792	5018446	24.0
1934	653793	5018411	24.0
1935	653755	5018416	24.0
1936	653747	5018463	24.0
1937	653702	5018464	24.0
1938	653707	5018315	24.1
1939	653758	5018316	24.1

Table 6.3: Total Sound Pressure Level [dB(A)] at Non-Participating Residences —Vestas V110-2.0 MW Layout

Residence ID	Easting	Northing	Total Sound Pressure Level
1940	653752	5018374	24.0
1941	653661	5018297	24.1
1942	653758	5018240	24.1
1943	653752	5018171	24.2
1944	653751	5018124	24.2
1945	653942	5017978	24.4
1947	651904	5018494	23.8
1958	645562	5018102	22.8
1959	645442	5018145	22.7
1971	643942	5018308	22.1
1972	643141	5019297	21.2
1983	647631	5019089	22.7
1989	648740	5019369	22.7
1990	649770	5019268	23.0
1994	645357	5021363	20.7
2025	656471	5023844	20.2
2032	660021	5024568	19.4
2042	655366	5029593	17.3
2048	653243	5028379	17.9
2049	652791	5028959	17.6
2058	653400	5029334	17.5
2060	648024	5029228	17.2
2063	648888	5025331	19.2
2072	648977	5025316	19.2
2102	648470	5022730	20.6
2103	648649	5021827	21.1
2108	648674	5021783	21.2
2136	647038	5026606	18.3
2151	641990	5025734	17.8
2152	641714	5025752	17.7
2156	642112	5026144	17.6
2166	642188	5027612	17.0
2167	643553	5027244	17.5
2172	645163	5028670	17.1
2179	644981	5029359	16.8
2184	644765	5030512	16.3
2192	638883	5030528	15.3
2197	639861	5027966	16.4
2212	639954	5030126	15.6
2221	641151	5027693	16.8
2234	639695	5027134	16.7
2244	640897	5024476	18.1
2253	640821	5024221	18.1
2254	636866	5024015	17.1
2270	637353	5024924	16.9
2284	637328	5028811	15.5
2288	641136	5022492	19.0
2300	649019	4991139	26.0
2309	649026	4989797	25.0
2310	649165	4989509	25.0
2317	649212	4987960	23.7

Table 6.3: Total Sound Pressure Level [dB(A)] at Non-Participating Residences —Vestas V110-2.0 MW Layout

Residence ID	Easting	Northing	Total Sound Pressure Level
2318	649190	4988056	23.7
2319	649114	4988078	23.7
2325	649064	4992930	26.7
2333	649280	4993534	27.1
2334	649271	4993557	27.1
2341	647627	4993445	25.4
2344	647698	4993970	25.6
2348	647604	4994984	25.9
2352	651457	4993587	31.6
2358	651076	4993540	30.5
2362	658654	4990393	26.8
2364	647608	4990512	24.1
2369	647546	4987953	22.6
2373	646299	4989430	22.7
2378	646229	4988848	22.3
2379	646166	4988614	22.2
2380	646047	4988570	22.1
2383	646173	4990709	23.2
2386	649219	4987865	23.6
2387	649229	4987772	23.5
2388	649229	4987697	23.5
2389	649231	4987636	23.4
2390	649237	4987548	23.3
2393	649251	4987389	23.2
2394	649234	4987308	23.1
2395	649251	4987246	23.1
2396	649263	4987476	23.3
2397	649234	4987167	23.0
2398	649236	4987056	22.9
2399	649241	4986974	22.9
2400	649241	4986927	22.8
2401	649250	4986857	22.8
2402	649245	4986811	22.8
2403	649244	4986724	22.7
2404	649247	4986676	22.6
2405	649259	4986631	22.6
2406	649254	4986581	22.6
2414	643934	5009635	30.7
2415	643946	5009641	30.7
2417	644853	5009639	33.9
2418	644862	5009641	33.9

Note: Coordinates are in WGS84 UTM14N

Dakota Range

Codington and Grant Counties, South Dakota

To: Conditional Use Permit Application Reviewers

From: Mark Mauersberger, Dakota Range

Date: May 3, 2017

RE: Third Party Reports

The Example Decommissioning Report (Tab 11), the Example Noise Impact Analysis (Tab 12), and the Example Shadow Flicker Analysis (Tab 13), will be provided to the Codington County Planner separately from the May 3 application submission. Dakota Range will provide these documents no later than two weeks before the scheduled Board of Adjustment meeting.

c/o Apex Clean Energy, Inc.
310 4th Street NE, Suite 200 | Charlottesville, VA 22902
T 434.220.7595 | F 434.220.3712
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Grant County Compiled Zoning Ordinances

01/25/2018

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DISCLAIMER:

The Zoning Ordinances that appear in this document are meant to reflect the most current zoning regulations adopted by Grant County. This document is provided for informational purposes only and should not be relied upon as the definitive authority for local legislation. The official printed copies of the various zoning ordinances may be reviewed in the Office of the County Auditor.

SOURCE:

The source of each section is included in the history note appearing in brackets at the end thereof. The absence of such a note indicates that the section was adopted for the first time with the adoption of Ordinance 2004-01.

ARTICLE I
SHORT TITLE AND APPLICATION

Section 101. Title. This regulation may be known and may be cited and referred to as the "Grant County Zoning Ordinance" to the same effect as if the full title were stated. [Ord. 2004-1]

Section 102. Jurisdiction. Pursuant to SDCL Chapter 11-2, 1967, as amended, the provision of this Ordinance shall apply within the unincorporated areas of Grant County, South Dakota, as established on the map entitled "The Official Zoning Map of Grant County, South Dakota." [Ord. 2004-1]

Section 103. Provisions of Ordinance Declared to be Minimum Requirements. In their interpretation and application, the provisions of this Ordinance shall be held to be minimum requirements, adopted for the promotion of the public health, safety, morals, or general welfare. Wherever the requirements of this Ordinance are at variance with the requirements of any other lawfully adopted rules, regulations, ordinances, deed restrictions, or covenants, the most restrictive or that imposing the higher standards, shall govern. [Ord. 2004-1]

Section 104. Purpose.

These regulations have been based upon the Grant County Comprehensive Land Use Plan adopted by the Board of County Commissioners, and are in conformance with Chapter 11-2 of the South Dakota Compiled Laws. These regulations are designed to carry out the goals and objectives of the plan, but especially to lessen congestion in the streets; to secure safety from fire, panic and other dangers; to promote health and the general welfare; to provide adequate light and air; to prevent the overcrowding of land; to avoid undue concentration or scattering of population; and to encourage a distribution of population or mode of land utilization that will facilitate the economical and adequate provision of transportation, water, drainage, sewerage, schools, parks, or other public requirements.

These regulations have been made with reasonable consideration to the character and intensity of the various land uses and the need for public facilities and services that would develop from those uses. These regulations are necessary for the best physical development of the county. The regulations are intended to preserve and protect existing property uses and values against adverse or unharmonious adjacent uses by zoning all unincorporated land except those areas where joint zoning jurisdiction has been granted to a municipality. [Ord. 2004-1]

ARTICLE II
DEFINITIONS

Section 201. For the purpose of this Ordinance, certain terms and words are hereby defined. Words used in the present tense shall include the future; the singular number shall include the plural and the plural the singular; the word "building" shall include the word "structure", the word "shall" is mandatory and not discretionary; the word may is permissive; the word person includes a firm, association, organization, partnership, trust, company or corporation, as well as, an individual; the word lot includes the word plat or parcel; and the words used or occupied include the words intended, designed, or arranged to be used or occupied. Any word not herein defined shall be as defined in any recognized standard English dictionary. [Ord. 2004-1]

Section 202. Accessory Buildings and Uses. A subordinate building or portion of the principal building, the use of which is incidental to and customary relating to the principal building or to the main use of the premises and which is located on the same lot with such principal building or use. An accessory use is a use which is incidental to the main use of the premises. [Ord. 2004-1, Rev. 2016-01]

Section 203. Zoning Officer. The individual appointed by the Board of County Commissioners and designated to administer and enforce the zoning ordinance. [Ord. 2004-1]

Section 204. Adult Amusement or Entertainment Establishment. Any use which has as part of its operations amusement or entertainment which is distinguished or characterized by an emphasis on material depicting, describing, or relating to "specified sexual activities" or "specified anatomical areas" as herein defined, or which features topless dancers, exotic dancers, strippers, male or female impersonators, or similar entertainment. [Ord. 2004-1]

Section 205. Adult Bookstores. An establishment having as a substantial or significant portion of its stock and trade, books, magazines, and other periodicals which are distinguished or characterized by their emphasis on matters depicting, describing, or relating to "specified sexual activities" or "specified anatomical areas" as herein defined, or an establishment with a segment or section devoted to the sale or display of such materials. [Ord. 2004-1]

Section 206. Adult Mini-motion Picture Theater. An enclosed building with a capacity for less than fifty (50) persons used for presenting material for observation by patrons and which excludes minors by virtue of age. [Ord. 2004-1]

Section 207. Adult Motion Picture Theater. An enclosed building used for presenting material distinguished or characterized by an emphasis on matter depicting, describing or relating to "specified sexual activities" or "specified anatomical areas" as herein defined, for observation by patrons therein. [Ord. 2004-1]

Section 208. Adult Photo Studio. An establishment which, on payment of a fee, provides photographic equipment and/or models for the purpose of photographing "specified anatomical areas", as herein defined. [Ord. 2004-1]

Section 209 Adult Use. The term "adult use" shall include adult amusement or entertainment establishment, adult bookstores, adult mini motion picture theaters, adult motion picture theaters, and adult photo studios. [Ord. 2004-1]

Section 209a. Agribusiness Activities. The use of land for the following commercial purposes related to raising, growing, processing, or storage of farm products: custom fertilizer/herbicide application, custom planting, custom harvesting, grain storage, or processing of agriculturally-related raw products raised, grown or purchased by the landowner or operator. [Ord 2016-01, Rev. 2016-01B]

Section 210 Agriculture. The use of land for agricultural purposes including farming, dairying, raising, breeding, or management of livestock, poultry, or honey bees, truck gardening, forestry, horticulture, floriculture, viticulture, and the necessary accessory uses for packaging, treating or storing the produce providing that the operation of any such accessory use shall be secondary to the normal agricultural activities. This definition includes intensive agricultural activities such as concentrated animal feeding operations but not agribusiness activities. [Ord. 2004-1, Rev. 2016-01]

Section 211 Airport. A place where aircraft can land and takeoff, usually equipped with hangers, facilities for refueling and repair, and various accommodations for passengers, including heliports. [Ord. 2004-1]

Section 211a. Animal Feeding Operation Structure. An anaerobic lagoon, formed manure storage area/structure, egg wash water storage structure, earthen manure storage basin, feedlot, confinement building or other structure associated with an animal feeding operation. [Ord. 2016-01]

Section 212. Animal Husbandry: The dairying, raising of livestock, breeding or keeping of animals, fowl or birds as a business for gainful occupation. [Ord. 2004-1]

Section 213. reserved [Ord. 2004-1, Rev. 2016-01]

Section 214. Animal Unit: See Article XIII. [Ord. 2004-1]

Section 215. reserved [Ord. 2004-1, Rev. 2016-01]

Section 216. reserved [Ord. 2004-1, Rev. 2016-01]

Section 217 reserved [Ord. 2004-1, Rev. 2016-01]

Section 218. Applicant: An individual, a corporation, a group of individuals, partnership, joint venture, owners, or any other business entity having charge or control of one or more concentrated animal feeding operations. [Ord. 2004-1]

Section 219. Basement. A basement has more than one-half (1/2) of its height below grade. [Ord. 2004-1]

Section 220. Bed and Breakfast (B & B's). A private single-family residence, which is used to provide, limited meals and temporary accommodations for a charge to the public. Such establishments should be located where there will be minimal impact on surrounding properties and should comply with the following conditions:

1. They shall be in compliance with applicable state laws including registration with the South Dakota Department of Health, maintaining a guest list, and providing a smoke detector in each sleeping room.

2. Accessory use signs shall be based on similar requirements for a home occupation permit and shall not be more than two (2) square foot in area.

3. Such uses shall be an incidental use with an owner occupied principal dwelling structure provided that not more than four bedrooms in such dwelling structure shall be used for such purpose.

4. The length of stay shall not exceed fourteen (14) days during any one hundred twenty-- (120) day consecutive period.

5. Meals shall be limited to breakfast, which is prepared in a common facility (household kitchen). Meals may be served only to overnight registered guests and cooking is not permitted in the sleeping rooms.

The building shall meet all building codes and zoning requirements. A site plan showing the location of guest parking spaces and floor plan showing a location of the sleeping rooms, lavatories, and bathing facilities, and kitchen shall be submitted with application. [Ord. 2004-1]

Section 220a. Best Management Practices. 1) Methods or techniques identified by the county to be effective in achieving an objective. 2) Measures contained in USDA NRCS South Dakota Technical Guide, either managerial or structural, that are determined to be the most effective, practical means of preventing or reducing pollution inputs from non-point sources to water bodies. [Ord. 2016-01]

Section 221. Board of County Commissioners. The governing body of Grant County. [Ord. 2004-1]

Section 222. Building. Any structure designed for the support, shelter and protection of persons, animals, or property. [Ord. 2004-1]

Section 223. Buildings, Height of. The vertical distance from the grade to the highest point of the coping of a flat roof or to the deck line of a mansard roof, or to the mean height level between the eaves and ridge for gable, hip and gambrel roofs. [Ord. 2004-1]

Section 223a. Calamity. An event causing great and often sudden damage or distress to structures or use of land. [Ord. 2016-01]

Section 224. Campground. Shall mean a plot of ground for public use upon which two or more campsites are located, established, maintained, advertised, or held out to the public, to be a place where camping units an be located and occupied as temporary living quarters. Campgrounds for tent trailers and recreational vehicles should be sited with consideration for access to the property. The campground should be designed to minimize the impact from adjacent major thoroughfares. [Ord. 2004-1]

Section 225 Change in Operation: Change in operation means a cumulative increase of more than 99 animal units, after November 1, 1997, which are confined at an unpermitted concentrated animal feeding operation. [Ord. 2004-1]

Section 225a. Certified Crop Advisor. Means any crop advisor/agronomist certified by the American Society of Agronomy. [Ord. 2016-01]

Section 225b. Concentrated Animal Feeding Operation, New. A new Concentrated animal feeding operation is a concentrated animal feeding operation which is located where one previously did not exist; or an expansion of an existing concentrated animal feeding operation from one class to a new class. [Ord. 2016-01]

Section 226. Concentrated Animal Feeding Operation. A Concentrated Animal Feeding Operation is defined as a lot, yard, corral, building or other area where animals have been, are, or will be stabled or confined for a total of 45 days or more during any 12-month period, and where crops, vegetation, forage growth, or post harvest residues are not sustained over any portion of the lot or facility. Two or more animal feeding operations under common ownership are single animal operation if they adjoin each other, or if they use a common area, or if they use a common area or system for disposal of manure. [Ord. 2004-1]

Section 227. Comprehensive Plan. The adopted long-range plan intended to guide the growth and development of Grant County. [Ord. 2004-1]

Section 228. Conditional Use. A conditional use is a use that would not be appropriate generally or without restriction throughout the zoning division or district, but which, if controlled as to number, area, location, or relation to the neighborhood, would promote the public health, safety, welfare, morals, order, comfort, convenience, appearance, prosperity, or general welfare. Such uses may be permitted in a zoning district as conditional uses, as specific provisions for such exceptions are made in these zoning regulations. Conditional uses are subject to evaluation and approval by the Board of Adjustment and are administrative in nature. [Ord. 2004-1]

Section 229. Contractor Shops and Yards. Those facilities to include structures and land areas where the outdoor storage of equipment and supplies used for various types of construction are stored. Examples of equipment and supplies include but are not limited to the following – road construction, building construction, gravel operations, and general contracting services. [Ord. 2004-1]

Section 230. Day Care Center. A facility used only for providing day care, nursery or pre-kindergarten services, and holding certificate of licensure by the State of South Dakota. [Ord. 2004-1K]

Section 230. District, Zoning. A section or sections of the County for which regulations governing the use of buildings and premises, the height of buildings, the size of yards, and the intensity of use are uniform. [Ord. 2004-1]

Section 231. Domestic Sanitary Sewage Treatment Facility. Shall mean the structures equipment and processes required to collect, carry away, and treat and dispose of wastewater, industrial wastes, and or sludge. [Ord. 2004-1]

Section 232. Dwelling. Any building, including seasonal housing structures, or a portion thereof, which is designed and used exclusively for residential purposes. This definition does not include a mobile home or manufactured home. [Ord. 2004-1]

Section 233. Dwelling, Farm. Any dwelling farmer owned or occupied by the farm owners, operators, tenants, or seasonal or year-around hired workers. [Ord. 2004-1]

Section 234. Dwelling, Single-Family. A building occupied exclusively by one (1) family. [Ord. 2004-1]

Section 235. Dwelling Unit. One (1) or more rooms, containing sleeping quarters, in a dwelling occupied as separate living quarters by a single family. [Ord. 2004-1]

Section 235a. Engineer. Means any engineer licensed by the State of South Dakota. [Ord. 2016-01]

Section 235b. Established Residence. A dwelling established before the siting of a new concentrated animal feeding operation or the expansion of an existing concentrated animal feeding operation. [Ord. 2016-01]

Section 236. Existing Farmstead. An existing farmstead shall include a livable house occupied by the owner or tenant within the last three (3) years and shall have been existing on the site for at least five (5) years and the site shall have been used in the past as a farmstead for normal farming operation. The Planning Commission may consider defining an identifiable parcel as an existing farmstead if the proposed site meets the following criterion:

1. Evidence that the proposed site was once used for human habitation. This may be determined by existence of buildings/foundations and/or an established shelterbelt.

2. Information regarding the location of flood plain, access to roads and utilities, and other appropriate site information may be considered by the Planning Commission in determining the suitability of the parcel for development. [Ord. 2004-1]

Section 237. Family. One (1) or more persons related by blood, marriage, or adoption occupying a dwelling unit as a single household unit. A family may include two (2), but not more than two (2), persons not related by blood, marriage, or adoption. A family shall not include more than three (3) adults who are unrelated by blood or law. This definition shall not include foster families as regulated by the State of South Dakota. [Ord. 2004-1]

Section 238. Farm. An area with or without family dwelling which is used for the growing of the usual farm products, such as vegetables, fruit, trees and grain, and their storage on the area, as well as for the raising, feeding, or breeding thereon of the usual farm poultry and farm animals, such as horses, cattle, sheep and swine. The term "farming" includes the operating of such an area for one or more of the above uses, including dairy farms with the necessary accessory uses for treating or storing the produce; provided, however, that the operation of such accessory uses shall be secondary to that of the normal farming activities. [Ord. 2004-1]

Section 238a. Feedlot. Feedlot means pens or similar areas with dirt, or concrete (or paved or hard) surfaces. Animals are exposed to the outside environment except for possible small portions affording some protection by windbreaks or small shed type shade areas. Feedlot is synonymous with other industry terms such as open lot, pasture lot, dirt lot, or dry lot. [Ord. 2016-01]

Section 239. Fence. A structure used as a boundary, screen, separation, means of privacy, protection or confinement, and is constructed of wood, plastic, metal, wire mesh, masonry or other similar material and is used as a barrier of some sort. [Ord. 2004-1]

Section 240. Frontage. All the property on one (1) side of a street or road. [Ord. 2004-1]

Section 240a. General Permit. South Dakota General Water Pollution Control Permit for Concentrated Animal Feeding Operations [Ord. 2016-01]

Section 241. Game Lodge. A building or group of two (2) or more detached, or semi-detached, or attached buildings occupied or used as a temporary abiding place of sportsmen, hunters and fishermen, who are lodged with or without meals, and in which there are sleeping quarters. [Ord. 2004-1]

Section 242. Garage, Private. An accessory building used for the storage of not more than four (4) vehicles owned and used by the occupant of the building to which it is necessary. Vehicles include cars, pickups, and boats. [Ord. 2004-1]

Section 243. Home Occupation. An occupation engaged in by the occupants of a dwelling provided that:

1. No person other than members of the family residing on the premises shall be engaged in such occupation;

2. The use of the dwelling unit for the home occupation shall be clearly incidental and subordinate to its use of residential purposes by its occupants, and not more than twenty-five (25) percent of the floor area of the dwelling unit shall be used in the conduct of the home occupation;

3. There shall be no change in the outside appearance of the building or premises, or other visible evidence of the conduct of such home occupation other than one sign, not to exceed two (2) square feet in area, non-illuminated;

4. No home occupation shall be conducted in any accessory building in connection with a non-farm dwelling. Accessory building use in connection with a farm dwelling shall be agricultural-related;

5. No traffic shall be generated by such home occupation in greater volumes than would normally be expected in a residential neighborhood, and any need of parking generated by the conduct of such home occupation shall be provided off the street and other than in a required front yard;

6. No equipment or process shall be used in such home occupation which creates noise, vibration, glare, fumes, odors, or electrical interference detectable to the normal senses off the lot. In the case of electrical interference, no equipment or process shall be used which creates visual or audible interference in any radio or television receivers off the premises, or causes fluctuations in line voltage off the premises.

7. There is no commodity sold upon the premises, except that which is prepared on the premises in connection with such occupation or activity; [Ord. 2004-1]

Section 243a. General Compatibility with Adjacent Properties. All uses listed as permitted or as conditional uses are generally compatible with other property in a specified zoning district. If such uses are not generally compatible, they should be prohibited within the specified district. Conditional uses may only be denied in accordance with definable criteria in order that an applicant may know under which circumstances a permit may be granted in this location. In Grant County, general compatibility refers to the manner of operation of a use. The Board of Adjustment may consider compatibility when prescribing conditions for approval of a permit, but those conditions should be uniformly required of similar uses under similar circumstances throughout the county. [Ord. 2016-01]

Section 244. Horticultural services. Commercial services which are oriented to support the science or practical application of the cultivation of fruits, vegetables, flowers, and plants. [Ord. 2004-1]

Section 244a. **Inventory** (in reference to Article XIII). The total number of animal units located on a concentrated animal feeding operation. [Ord. 2016-01]

Section 245. Junkyards/Salvage Yards. The use of more than one thousand (1,000) square feet of any land, building, or structure, for commercial purposes, where waste, discarded materials such as scrap metals, used building materials, used lumber, used glass, discarded vehicles, paper, rags, rubber, cordage, barrels, etc., are stored. [Ord. 2004-1]

Section 246. Kennel. Any premise or portion thereon where dogs, cats, or other household pets are raised, trained, boarded, harbored, or kept for remuneration. Veterinary clinics, animal hospitals and animal shelters are specifically excluded. [Ord. 2004-1]

Section 246a. Letter of Assurances. A list of conditions signed by the applicant for a permit acknowledging agreement to follow the conditions of the permit. [Ord. 2016-01]

Section 247. Lot, Buildable. (1) A parcel of land occupied or intended for occupancy by a use permitted in this Ordinance, including one (1) main building together with its accessory buildings, the open spaces and parking spaces required by this Ordinance. (2) A lot which is a part of a subdivision, the plat of which has been recorded in the office of the County Register of Deeds at the time of the adoption of this Ordinance, provided that said lot has a frontage of not less than seventy-five (75) feet; or an irregular tract lot described by a deed recorded in the office of the County Register of Deeds at the time of the passage of this Ordinance; provided that if a lot has less width or area as required by this Ordinance, the lot is not a buildable lot. [Ord. 2004-1]

Section 248. Lot, Corner. A lot abutting upon two (2) or more streets at their intersection. [Ord. 2004-1]

Section 249. Lot, Depth of. The average horizontal distance between the front and rear lot lines. [Ord. 2004-1]

Section 250. Lot, Double Frontage. A lot having a frontage of two (2) streets as distinguished from a corner lot. [Ord. 2004-1]

Section 251. Manufactured Home.

1. An industrialized building unit constructed on a chassis for towing to the point of use and designed to be used for continuous year-round occupancy as a single dwelling. For the purposes of this ordinance manufactured homes are further defined as follows:

    a. Type A Manufactured Home shall:

        i. Have more than 1,200 square feet of occupied space in a double-section or larger multi-section unit.

        ii. The running gear and hitch have been removed.

        iii. Has been anchored to a foundation and permanent footing.

        iv. The foundation shall be (a) an approved wood basement constructed of 2 x 6 frame-work and treated with water resistant materials; or (b) a foundation shall be constructed with eight inches poured concrete or concrete block.

v. The footing to be a minimum of eight (8) inches thick by sixteen (16) inches wide poured concrete with top of footing to be sixteen (16) inches below grade.

vi. The age of the manufactured house may not exceed fifteen (15) years from the date of manufacture.

vii. Utilize a permanent perimeter enclosure in accordance with approved installation standards.

viii. Have a gabled roof with a pitch of at least 2/12 feet.

ix. Have siding material of a type customarily used on site-constructed residence.

x. Have roofing material of a type customarily used on site-constructed residences.

b. Type B Manufactured Home shall:

i. Have more than 700 square feet of occupied space in a single, double, expando or multi-section unit.

ii. Utilize a perimeter enclosure in accordance with approved installation standards.

iii. Be anchored to the ground, in accordance with manufacturer's specifications or as prescribed by the ANSI/NFPA 501A Standards.

iv. The age of the manufactured house may not exceed fifteen (15) years from the date of manufacture.

v. Be placed on a support system, in accordance with approved installation standards. [Ord. 2004-1]

Section 251a. Manure, Animal: Poultry, livestock, or other animal excreta or mixture of excreta with feed, bedding or other materials. [Ord. 2016-01]

Section 251b. Manure, Incorporated. Animal manure applied to the land surface and mechanically mixed into the soil within twenty-four (24) hours. [Ord. 2016-01]

Section 251c. Manure, Injected. Animal manure injected or tilled into the soil at the time of application. [Ord. 2016-01]

Section 251d. Manure, Liquid. A suspension of livestock manure in water in which the concentration of manure solids is low enough to maintain a free-flowing fluid. Liquid manure also includes slurry which is a mixture of livestock manure, bedding and waste feed in water. Liquid manure and slurry is typically applied to fields by pumping through irrigation equipment or by hauling and spreading with a tank wagon. The solids content of liquid manure or slurry is less than ten (10) percent. A practical definition of liquid manure includes any livestock manure mixture that can be pumped through conventional liquid manure handling equipment. [Ord. 2016-01]

Section 251e. Manure Management Facilities. Any structure or facility utilized for the storage of animal manure. [Ord. 2016-01]

Section 251f. Manure, Surface Applied. Animal manure applied to the land surface without benefit of incorporation or injection. This shall not include the use of animal manure in irrigation waters. [Ord. 2016-01]

Section 252. Modular Home.

1. Modular homes shall meet the following regulations.

    a. Modular homes shall meet or exceed Uniform Building Codes.

    b. Modular homes will include all off-site constructed homes, which may be transported to the site in one or more sections.

    c. Modular homes shall have more than 1,000 square feet in ranch style and 850 square feet split and be placed on a permanent foundation.

    d. Modular homes shall not have attached running gear and a trailer hitch or the capacity to have attached running gear and trailer hitch.

    e. Modular homes shall have a minimum of a 4/12-roof pitch.

    f. Have siding material of a type customarily used on site-constructed residences.

    g. Have roofing material of a type customarily used on site-constructed residences. [Ord. 2004-1]

Section 253. Motel. A series of attached, semi-attached, or detached sleeping or living units, for the accommodation of transient guests and not customarily including individual cooking or kitchen facilities, said units having convenient access to off-street parking spaces for the exclusive use of guests or occupants. [Ord. 2004-1]

Section 254 Nonconforming Use. Any building or land lawfully occupied by a use at the time of passage of this regulation or amendment thereto, which does not conform after the passage of this regulation or amendment. Exception: A use vested in accordance with Section 1305 shall not be deemed a nonconforming use in such district. [Ord. 2004-1, Rev. 2016-01]

Section 254a. Nonstandard Use. The category of nonconformance consisting of lots occupied by buildings or structures or uses which existed immediately prior to the effective date of this ordinance which fail to comply with any of the following: minimum lot requirements for the area, density, width, front yard, side yard, rear yard, height, unobstructed open space, parking for the district in which they are located, or minimum separation/setback distances between uses and structures even though the use of the premises conforms with the allowable uses within the district as set out in the provisions of this ordinance. [Ord. 2016-01]

Section 254b. Nonstandard Concentrated Animal Feeding Operation. A concentrated animal feeding operation existing which is classified as a nonstandard use and is determined to be vested in accordance with Section 1305. [Ord. 2016-01]

Section 255. Non-Farm Dwelling. Any occupied dwelling which is not a farm dwelling. [Ord. 2004-1]

Section 256. Parking Space. An area, enclosed or unenclosed, sufficient in size to store one (1) automobile, together with a driveway connecting the parking space with a street or alley. [Ord. 2004-1]

Section 257. Parks and Recreation Areas. Public, non-commercial recreation facilities open to the general public an requiring minimal structural development, including, but not limited to playgrounds, parks, monuments, green strips, open space, mini-parks, athletic fields, boat launching ramps, piers and docks, picnic grounds, public campgrounds swimming pools, and wildlife and nature preserves, along with any necessary accessory facilities, rest rooms, bath houses, and the maintenance of such land and facilities, but not including private, commercial campgrounds, commercial recreation and/or amusement centers. [Ord. 2004-1]

Section 258. Permit. A permit required by these regulations unless stated otherwise. [Ord. 2004-1]

Section 259. Permitted Use. Any use listed as a "permitted use" in a particular zoning district and subject to the restrictions applicable to that zoning district. Permitted uses are allowable by right and simply require the property owner to obtain a permit to establish the use based upon a properly filed application, without further action. [Ord. 2004-1, Rev. 2016-01]

Section 260. Potential Pollution Hazard. A Class D Concentrated Animal Feeding Operation of 50 to 999 Animal Units is required to obtain a conditional use permit when a potential pollution hazard exists. Factors to be considered by the Zoning Officer in determining a Potential Pollution Hazard include the following:

1. The Concentrated Animal Feeding Operation does not meet the minimum setback and separation distances of these regulations.

2. A Potential Water Pollution Hazard exists due to siting a concentrated animal feeding operation over a shallow aquifer or drainage which contributes to the waters of the State. [Ord. 2004-01, Rev. 2016-01]

Section 260a. Principal Building. The structure in which the principal use of the lot is conducted. For example, a farm dwelling on farm; or dwelling on a residential lot; or a gas station on a commercial lot. [Ord. 2016-01]

Section 261. Private Shooting Preserves. An acreage of at least one hundred and sixty (160) acres and not exceeding one thousand two hundred and eighty (1,280) acres either privately owned or leased on which hatchery raised game is released for the purpose of hunting, for a fee, over an extended season. [Ord. 2004-1]

Section 262. Private Shooting Preserves. An acreage of at least one hundred and sixty (160) acres and not exceeding one thousand two hundred and eighty (1,280) acres either privately owned or leased on which hatchery raised game is released for the purpose of hunting, for a fee, over an extended season. [Ord. 2004-1]

Section 263. Process Generated Wastewater. Water directly or indirectly used in the operation of an animal feeding operation. The term includes spillage or overflow from watering systems; water and manure collected while washing, cleaning or flushing pens, barns, manure pits or other areas; water and manure collected during direct contact swimming, washing or spray cooling of animals; and water used in dust control. [Ord. 2004-1]

Section 263. Private Wind Energy Conversion System (PWECS). Private Wind Energy Conversion System (PWECS). Any mechanism or device, not owned by a public or private utility company, designed for the purpose of converting wind energy into electrical or mechanical power to be used on the site where said power is generated. [Ord. 2004-1, Rev. 2004-1G]

Section 264. Process Wastewater. Process wastewater means any process generated wastewater and any precipitation (rain or snow) that comes into contact with the animals, manure, litter or bedding, feed, or other portions of the animal feeding operation. The term includes runoff from an open lot. [Ord. 2004-1]

Section 265. Religious Farming Community. A corporation formed primarily for religious purposes whose principle income is derived from agriculture and/or a farm which may or may not be held in collective ownership, in which multiple families reside on-site and use or conduct activities upon the property which are participated in, shared, or used in common by the members of the group residing thereon. [Ord. 2004-1]

Section 266 Rubble Site. A site for the disposition of refuse as defined by the South Dakota Department of Environment and Natural Resources. [Ord. 2004-1]

Section 267. Sale or Auction Yard or Barn. A place or building where the normal activity is to sell or exchange livestock. Livestock normally in yard or barn for one (1) day during sale or auction. [Ord. 2004-1]

Section 268. Sanitary Landfill. A site for the disposal of garbage and other refuse material. [Ord. 2004-1]

Section 269. Seasonal Camp Trailers or Recreational Vehicles. A vehicle designed for temporary seasonal living quarters. [Ord. 2004-1]

Section 270. Service Station. Any building or premises where automotive fuels are stored and made available for sale and dispensing through fixed equipment into fuel supply tanks or motor vehicles and where automotive supplies and accessories may or may not be available. [Ord. 2004-1]

Section 271. Shall. (when used in regard to concentrated animal feeding operations). means that the condition is an enforceable requirement of this permit. [Ord. 2004-1]

Section 272. Shallow Aquifer. An aquifer zero (0) to fifty (50) feet in depth in which the permeable media (sand and gravel) starts near the land surface, immediately below the soil profile. A shallow aquifer is vulnerable to contamination because the permeable material making up the aquifer (a) extends to the land surface so percolation water can easily transport contaminants from land surface to the aquifer, or (b) extends to near the land surface and lacks a sufficiently thick layer of impermeable material on the land or near the land surface to limit percolation water from transporting contaminants from the land surface to the aquifer. [Ord. 2004-1, Rev. 2016-01]

Section 272a. Setback. The setback of a building is the minimum horizontal distance between the street or property line and the front line of the building or any projection thereof, except cornices, unenclosed porches, and entrance vestibules and window bays projecting not more than three and one-half (3 1/2) feet from the building and having no more than fifty (50) square feet area and not extending above the first story of the building. [Ord. 2016-01]

Section 272b. Setback Between Uses. Unless specifically mentioned within this ordinance, the setback or separation distance between uses is the minimum horizontal distance measured from the wall line of a neighboring principal building to the wall line of the proposed building/structure/use. In regard to Concentrated Animal Feeding Operations the separation distance shall be measured from the wall line of the neighboring principal building to the wall line of the feedlot or structure housing animals and/or manure management facility. [Ord. 2016-01]

Section 273. reserved [Ord. 2004-1, Rev. 2016-01]

Section 274. Shelterbelt. A strip or belt of trees or shrubs established to reduce soil erosion and to protect yards, lots, buildings, livestock and residences, recreation and wildlife from wind. For the purposes of this ordinance a shelterbelt shall include ten (10) or more trees planted in a line, separated by a distance of forty (40) feet or less. [Ord. 2004-1]

Section 275. Shooting Range. shall be defined as an area for the discharge of weapons for sport under controlled conditions where the object of the shooting is an inanimate object such as, but not limited to, paper, metal or wooden targets. [Ord. 2004-1]

Section 276. Should. (when used in regard to concentrated animal feeding operations). means that the condition is a recommendation. If violations of the permit occur, the County will evaluate whether the producer implemented the recommendations contained in this permit that may have helped the producer to avoid the violation. [Ord. 2004-1]

Section 277. Significant Contributor of Pollution. To determine if a concentrated animal feeding operation meets this definition, the following factors are considered:

1. Size of feeding operation and amount of manure reaching waters of the state;

2. Location of the feeding operation in relation to waters of the state;

3. Means of conveyance of manure and process wastewater into waters of the state; and

4. The slope, vegetation, rainfall and other factors affecting the likelihood or frequency of discharge of animal wastes and process wastewater into waters of the state. [Ord. 2004-1]

Section 278. Street, Highway, or Road. All property acquired or dedicated to the public and accepted by the appropriate governmental agency for street, highway or road purposes. [Ord. 2004-1]

Section 279. Street, Highway or Road Right-of-Way (ROW) Line. A dividing line between a lot or parcel of land and a contiguous street, highway or road. [Ord. 2004-1]

Section 280. Structure. Anything constructed or erected, the use of which requires permanent location on the ground or attached to something having a permanent location on the ground. [Ord. 2004-1]

Section 281. Structure, Temporary. Anything constructed or erected, the use of which requires temporary location on the ground or attached to something having a temporary location on the ground. [Ord. 2004-1]

Section 282. Temporary Fireworks Sales Stand. A structure utilized for the licensed resale of fireworks during the time period allowed by South Dakota State Law. [Ord. 2004-1]

Section 283. Variance. A variance is a relaxation of the terms of the zoning ordinance where such variance will not be contrary to the public interest and where, owing to conditions peculiar to the property and not the result of the actions of the applicant, a literal enforcement of the ordinance would result in unnecessary and undue hardship. As used in this ordinance, a variance is authorized only for height, area, and size of structure or size of yards and open spaces; establishment or expansion of a use otherwise prohibited shall not be allowed by variance, nor shall a variance be granted because of the presence of non-conforming in the zoning district or uses in an adjoining zoning district. [Ord. 2004-1]

Section 283. Turbine. The parts of the Wind Energy System including the blades, generator, and tail. [Ord. 2004-1, Rev. 2004-1G]

Section 283a. Vested Right The right to continue a non-conforming and/or non-standard use despite a zoning ordinance that prohibits that use in a zoning district. [2016-01]

Section 284. Waters of the State. means all waters within the jurisdiction of this state, including all streams, lakes, ponds, impounding reservoirs, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private, situated wholly or partly within or bordering upon the state. [Ord. 2004-1]

Section 284. Utility. Any entity engaged in this state in the generation, transmission or distribution of electric energy including, but not limited to, a private investor owned utility, cooperatively owned utility, and a public or municipal utility. [Ord. 2004-1, Rev. 2004-1G]

Section 285. Yard. An open space on the same lot with a building, unoccupied and unobstructed. In measuring a yard for the purpose of determining the width of a side yard, the depth of a front yard, or the depth of a rear yard, the minimum horizontal distance between the lot line and bearing wall of the main building shall be used. [Ord. 2004-1]

Section 286. Yard, Front. A yard extending across the front of a lot between the side yard lines, and being the minimum horizontal distance between the road right-of-way line and the main bearing wall of the main building or any projections thereof other than the projections of the usual steps, unenclosed balconies or open porch. [Ord. 2004-1]

Section 287. Yard, Rear. Any yard extending across the rear of a lot measured between the side lot lines, and being the minimum horizontal distance between the rear lot line and the rear of the main building or bearing wall or any projections other than steps, unenclosed porches, or unenclosed balconies. On corner lots the rear yard may be to the rear of either street, provided that the minimum rear yard depth requirement shall be calculated on the longest average lot dimension. On interior lots the rear yard shall in all cases be at the opposite end of the lot from the front yard. [Ord. 2004-1]

Section 287. Wind Energy System (WES). A commonly owned and/or managed integrated system that converts wind movement into electricity. All of the following are encompassed in this definition of system:

a. Tower or multiple towers,
b. Generator(s),
c. Blades,
d. Power collection systems, and
e. Electric interconnection systems. [Ord. 2004-1, Rev. 2004-1G]

Section 288. Yard, Side. A yard between the main building and the side line of the lot being the minimum horizontal distance between the bearing wall of the building and the side yard line, and extending from the front lot line to the rear yard line. [Ord. 2004-1]

Section 289. Well. An artificial excavation or opening in the ground, made by means of digging, boring, drilling, jetting, or by any other artificial method, for the purpose of obtaining groundwater. Any series of openings, borings, or drillings developed and pumped collectively by a single pump unit shall be considered as one well. (SDCL 46-1-6) [Ord. 2016-01]

Section 290. Well, abandoned. A well which is in either such a state disrepair that its original purpose cannot be reasonably achieved or which has not been used for water production in the past two (2) years. [Ord. 2016-01]

Section 291. Well, Established. A water producing well that is either registered with the State of South Dakota or has well logs on file with the South Dakota Department of Environment and Natural Resources or has been used for more than one week for water production on a quarterly basis with the past two (2) years as established by sworn affidavit and filed as a miscellaneous document with the Grant County Register of Deeds.

ARTICLE III
ESTABLISHMENT OF DISTRICTS

Section 301. Districts. For the purpose of this regulation, the unincorporated areas of the County may be divided into any of the following zoning districts: A--Agricultural; CI--Commercial/Industrial; NR--Natural Resources; PD--Planned Development Project District; AP--Aquifer Protection Overlay District. [Ord. 2004-1]

Section 302. Provision for Official Zoning Map.

1. The unincorporated area of the County is hereby divided into zones, or districts, as shown on the Official Zoning Map which, together with all explanatory matter thereon, is hereby adopted by reference and declared to be a part of this Ordinance. The Official Zoning Map shall be identified by the signature of the Chairperson of the Board of County Commissioners attested by the County Auditor, and bearing the seal of the County under the following words: "This is to certify that this is the Official Zoning Map referred to in Section 302 of Ordinance 2004-1 adopted April 13, 2004 by Grant County, South Dakota."

   If, in accordance with the provisions of this Ordinance, changes are made in district boundaries or other matter portrayed on the Official Zoning Map, such changes shall be entered on the Official Zoning Map promptly after the amendment has been approved by the Board of County Commissioners, with an entry on the Official Zoning Map as follows: "On _____ by official action of the Board of County Commissioners, the following change(s) were made in the Official Zoning Map:" (brief description of nature of change), which entry shall be signed by the Chairman of the Board of County Commissioners and attested by the County Auditor. No amendment to this Ordinance which involves matter portrayed on the Official Zoning Map shall become effective until after such change and entry has been made on said map.

   No changes of any nature shall be made on the Official Zoning Map or matter shown thereon except in conformity with the procedures set forth in this Ordinance. Any unauthorized change of whatever kind by any person or persons shall be considered a violation of this Ordinance and punishable as provided under Article VIII.

2. In the event the Official Zoning Map becomes damaged, destroyed, lost, or difficult to interpret because of the nature or number of changes and additions, the Board of County Commissioners may, by Ordinance, adopt a new Official Zoning Map which shall supersede the prior Official Zoning Map. The new Official Zoning Map shall be identified by the signature of the Chairman of the Board of County Commissioners attested by the County Auditor, and bearing the seal of the County under the following words: "This is to certify that this Official Zoning Map supersedes and replaces the Official Zoning Map adopted (date of adoption of map being replaced) for Grant County, South Dakota."

Unless the prior Official Zoning Map has been lost, or has been totally destroyed, the prior map or any significant parts thereof remaining shall be preserved, together with all available records pertaining to its adoption or amendment. [Ord. 2004-1]

Section 303. Interpretation of District Boundaries.

1. A district name or letter symbol shown on the district map indicates that the regulations pertaining to the district designated by that name or symbol extend throughout the whole area in the unincorporated portions of the County bounded by the district boundary lines.

2. In cases where the boundary line is given a position within a street, road, or non-navigable stream, it shall be deemed to be in the center of the street, road, or stream, and if the actual location of such street, road, or stream varies slightly from the location as shown on the district map, then the actual location shall control.

3. In cases where a boundary line is shown as being located a specific distance from a street line or other physical feature, this distance shall control.

4. In cases where a boundary line is shown adjoining or coincident with a railroad, it shall be deemed to be in the center of the railroad right-of-way and distances measured from the railroad shall be measured from the center of the designated mainline track.

5. Where the district boundaries are not otherwise indicated and where the property has been or may hereafter be divided into blocks and lots, the district boundaries shall be construed to be the lot lines and where the districts designated on the Official Zoning Map accompanying and made a part of this Ordinance are bounded approximately by lot lines, said lot lines shall be construed to be the boundary of such districts unless said boundaries are otherwise indicated on the map or by resolution.

6. In unsubdivided property, unless otherwise indicated, the district boundary line on the Official Zoning Map accompanying and made a part of this Ordinance shall be determined by the use of the scale contained on such map. [Ord. 2004-1]

Section 304. All territory which may hereafter become a part of the unincorporated area of the County by the disincorporation of any village, town or city, or for some other reason may fall within the zoning jurisdiction of the County, shall automatically be classified in the "A" Agricultural District until within a reasonable time following disincorporation, or acquisition of zoning jurisdiction, the territory shall be appropriately classified by Ordinance. [Ord. 2004-1]

Section 305. Application of District Regulations. Except as hereafter provided:

1. No building shall be erected, converted, enlarged, reconstructed or structurally altered, nor shall any building or land be used except for a purpose permitted in the district in which the building or land is located.

2. No building shall be erected, converted, enlarged, reconstructed, or structurally altered to exceed the height limit established for the district in which the building is located.

3. No building shall be erected, converted, enlarged, reconstructed, or structurally altered except in conformity with the area and parking regulations of the district in which the building is located.

4. The minimum yards and other open spaces, including lot area per family, required by this Ordinance for each and every building at the time of passage of this Ordinance or for any building hereafter erected shall not be encroached upon or considered as yard or open space requirements for any other buildings, nor shall any lot area be reduced beyond the district requirements of this Ordinance.

5. All sign sizes, light, and location shall, at a minimum, meet all State and Federal laws and regulations. [Ord. 2004-1]

Section 306. Prohibited uses.

All uses and structures not specifically listed as a permitted or conditional use shall be prohibited. [Ord. 2004-1]

ARTICLE IV
NONCONFORMING USES OR LOTS OF RECORD

Intent. Within the districts established by this Ordinance or amendments that may later be adopted, there exist lots, structures, uses of land and structures, and characteristics of use, which were lawful before this Ordinance was passed or amended but which would be prohibited, regulated, or restricted under the terms of this Ordinance or future amendments. It is the intent of this Ordinance to permit these nonconformities to continue until they are removed, but not to encourage their survival. It is further the intent of this Ordinance that nonconformities shall not be enlarged upon, expanded or extended, nor be used as grounds for adding other structures or uses prohibited elsewhere in the same district. [Ord. 2004-1]

Section 401. When a nonconforming use has been changed to a conforming use, it shall not be changed subsequently to any nonconforming use. [Ord. 2004-1]

Section 402. In the event that a nonconforming use of any building or premises is, in fact, discontinued or its normal operation stopped for a period of one (1) year, the Board of Adjustment may adopt, after notice by registered or certified mail to the property owners, an amortization schedule to bring about the gradual elimination of such nonconforming use or occupancy. [Ord. 2004-1]

Section 403. No existing building devoted to a use not permitted by this Ordinance, in the district in which such building is located, except when required to do so by law, shall be enlarged, extended, converted, reconstructed or structurally altered, unless such use is changed to a use permitted in the district in which the building is located. [Ord. 2004-1]

Section 404. When a building, the use of which does not conform to the provisions of this Ordinance, is damaged by fire, explosion, or the public enemy, to the extent of more than sixty percent (60%) of its fair market value, it shall not be restored except in conformity with the regulations of the district in which the building is situated. [Ord. 2004-1]

Section 405. Unless vested in accordance with Section 1305, nothing in this Ordinance shall be interpreted as authorization for, or approval of, the continuance of the use of a building or premises in violation of zoning regulations in effect at the time of the effective date of this Ordinance. [Ord. 2004-1, Rev. 2016-01]

Section 406. If two (2) or more lots or combinations of lots and portions of lots with continuous frontage in single ownership are of record at the time of passage or amendments of this Ordinance, and if all or part of the lots do not meet the requirements established for lot width and area, the lands involved shall be considered to be an undivided parcel for the purposes of this Ordinance, and no portion of said parcel shall be used or sold in a manner which diminishes compliance with lot width and area requirements established by this Ordinance, nor shall any division of any parcel be made which creates a lot width or area below the requirements stated in this Ordinance. [Ord. 2004-1]

Section 407. On any nonconforming structure or portion of a structure containing a nonconforming use, work may be done on ordinary repairs, or on repairs or replacement of non-bearing walls, fixtures, wiring, or plumbing, provided that the nonconformity of the structure shall not be increased. [Ord. 2004-1]

Section 408. If a nonconforming structure or portion of a structure containing a nonconforming use becomes physically unsafe or unlawful due to the lack of repairs and maintenance, and is declared by any duly authorized official to be unsafe or unlawful by reason of physical condition, it shall not thereafter be restored, repaired, or rebuilt except in conformity with the regulations of the district in which it is located. [Ord. 2004-1]

Section 409. Continuation of Nonstandard Uses. Nonstandard uses existing immediately prior to the effective date of this ordinance may be continued, although such uses do not conform to the provisions hereof. Nonstandard uses buildings or structures may be enlarged or extended, converted, reconstructed, or structurally altered as follows:

1. Enlargements, extensions, conversions, or structural alterations may be made as required by law or ordinance.

2. Structural alteration of buildings or structures may otherwise be made if such changes do not encroach into an existing front yard, side yard, or rear yard which is less than the minimum required yards for the district in which they are located.

3. Enlargement, extension, conversion of buildings or structures may otherwise be made if such changes comply with the minimum required yards, lot area, height, landscaping, parking, and density for the district in which they are located. [Ord. 2016-01]

ARTICLE V
BOARD OF ADJUSTMENT, APPEALS, VARIANCE, AND CONDITIONAL USES

Section 501. Within Grant County, outside of incorporated municipalities, the power and jurisdiction related to this article shall be executed by the Board of Adjustment.

1. The Board of Grant County Commissioners shall appoint the Grant County Planning Commission and four (4) alternates to act as the County Board of Adjustment. The Alternates to the Board of Adjustment shall be the members of the Board of Grant County Commissioners. If a Planning Commissioner acting as a Board of Adjustment member is unable to attend a meeting, the Grant County Commissioner representing the district in which the applicant requesting a Board of Adjustment action, shall be the first alternate, subsequent alternates shall be chosen by the Board of Adjustment. The Board of Grant County Commissioners shall appoint the Grant County Planning Commission and two (2) alternates to act as the County Board of Adjustment. If a Planning Commissioner acting as a Board of Adjustment member is unable to attend a meeting, the first alternate, or the second alternate in turn, shall serve in the member's place. [Ord. 2004-1, Rev. 2004-1L]

2. The Chairman, or in his or her absence the Acting Chairman, may administer oaths and compel the attendance of witnesses in order to execute the purposes of this article. [Ord. 2004-1]

3. All meetings of the Board of Adjustment shall be open to the public. The Board of Adjustment shall keep minutes of its proceedings and shall keep records of its examinations and other official actions, all of which shall be immediately filed in the office of the Board of Adjustment and shall be public record. The Board of Adjustment shall keep record in the minutes showing the vote of each member upon each question or if absent or failing to vote, indicating that fact. [Ord. 2004-1]

Section 502. Appeals, Record of Appeal, Hearing and Stays. Appeals to Board of Adjustment may be taken by any person aggrieved or by an officer, department, board or bureau of the County or city/town affected by any decision of the administrative officer. Such appeals shall be taken within a reasonable time, as provided by the rules of the Board of Adjustment by filing with the officer from whom the appeal is taken and with the Board of Adjustment a notice of appeal specifying the grounds thereof. The officer from whom the appeal is taken shall forthwith transmit to the Board of Adjustment all the papers constituting the record upon which the action appealed from was taken.

An appeal stays all proceedings in furtherance of the action appealed from, unless the officer from whom the appeal is taken certifies to the Board of Adjustment after the notice of appeal shall have been filed with him, that by reason of facts stated in the certificate a stay would, in his opinion, cause imminent peril to life or property.

In such case, proceedings shall not be stayed otherwise than by a restraining order which may be granted by the Board of Adjustment or by a court of record on application on notice to the officer from whom the appeal is taken and on due cause shown.

The Board of Adjustment shall fix a reasonable time for the hearing of the appeal, give public notice thereof, as well as due notice to the parties in interest, and decide the same within a reasonable time. Upon the hearing, any party may appear in person or by agent or by attorney. [Ord. 2004-1]

Section 503. Powers and Jurisdiction Relating to Administrative Review. The County Board of Adjustment shall have the power to hear and decide appeals where it is alleged there is error in any order, requirement, decision or determination made by an Zoning Officer or agency based on or made in the enforcement of any zoning regulation or any regulation relating to the location of structures or to interpret any map. [Ord. 2004-1]

Section 504. Powers and Jurisdiction Relating to Conditional Uses. The County Board of Adjustment shall have the power to hear and decide, in accordance with the provisions of this regulation, requests for conditional uses or for decisions upon other special questions upon which the Board of Adjustment is authorized by this regulation to pass; to decide such questions as are involved in determining whether special conditions and safeguards as are appropriate under this regulation, or to deny conditional uses when not in harmony with the purpose and intent of this regulation. A conditional use permit shall not be granted by the Board of Adjustment unless and until:

1. A written application for a conditional use is submitted, indicating the section of this regulation under which the special exception is sought and stating the grounds on which it is requested.

2. Notice of hearing shall be published once ten (10) days prior to the hearing in a paper of general circulation in the area affected.

3. The public hearing shall be held. Any party may appear in person, or by agent or attorney.

4. The Board of Adjustment shall make a finding that it is empowered under the section of this ordinance described in the application to grant the conditional use, grant with conditions, or deny the conditional use, and that the granting of the conditional use will not adversely affect the public interest.

5. Before any conditional use is granted, the Board of Adjustment shall make written findings certifying compliance with the specific rules governing individual conditional uses and that satisfactory provision and arrangement has been made concerning the following, where applicable:

    a. Entrance to and exit from property and proposed structures thereon with particular reference to automotive and pedestrian safety and convenience, traffic flow and control, and access in case of fire or catastrophe.

    b. Off-street parking and loading areas where required, with particular attention to the items in (a) above and the economic, noise, glare, odor or other effects of the conditional use on adjoining properties and properties generally in the district.

    c. Refuse and service areas, with particular reference to the items in (a) and (b) above.

    d. Utilities, with reference to locations, availability, and compatibility.

    e. Screening and buffering with reference to type, dimensions, and character.

    f. Signs, if any, and proposed exterior lighting with reference to glare, traffic safety, economic effect and compatibility and harmony with properties in the district.

    g. Required yards and other open spaces.

h. General compatibility with adjacent properties and other property

6. A conditional use that is granted but not used within two (2) years shall be considered invalid unless an extension has been requested and approved by the Board of Adjustment.

7. The affirmative vote of two-thirds (2/3) five (5) votes of the full membership of the Board of Adjustment is required to approve a conditional use.

8. In granting the Conditional Use Permit, the Board of Adjustment may prescribe appropriate conditions and safeguards in conformity with this regulation. Violation of such conditions and safeguards, when made a part of the terms under which the conditional use permit is granted, shall be deemed a violation of this ordinance and punishable under Section 808 of this ordinance.

9. Reapplication. No applicant requesting a conditional use permit whose application includes the same or substantially the same requirements for the same or substantially the same property which has been denied by the Board of Adjustment shall be again considered by the Board of Adjustment before the expiration date of six (6) months from the date of the final action on the petition. [Ord. 2004-1]

Section 505. Powers and Jurisdiction Relating to Variances. The County Board of Adjustment shall have the power, where, by reason of exception, narrowness, shallowness or shape of a specific piece of property at the time of the enactment of this regulation, or by reason of exceptional topographic conditions or other extraordinary and exceptional situation or condition of such piece of property, the strict application of any regulation under this regulation would result in peculiar and exceptional practical difficulties to, or exceptional and undue hardships upon, the owner of such property, to authorize, upon an appeal relating to the property, a variance from such strict application so as to relieve such difficulties or hardship, if such relief may be granted without substantially impairing the intent and purpose of this regulation.

1. No such variance shall be authorized by the County Board of Adjustment unless it finds that the strict application of the Regulation would produce undue hardship; such hardship is not shared generally by other properties in the same zoning district and the same vicinity; the authorization of such variance will not be of substantial detriment to adjacent property and the character of the district will not be changed by the granting of the variance; and the granting of such variance is based upon reasons of demonstrable and exceptional hardship as distinguished from variations for purposes of convenience, profit, and caprice.

2. No variances shall be authorized unless the County Board of Adjustment finds that the condition or situation of the property concerned or the intended use of the property is not of so general or recurring a nature as to make reasonably practicable the formulation of a general regulation to be adopted as an amendment to this regulation.

3. A variance from the terms of this regulation shall not be granted by the County Board of Adjustment unless and until a written application for a variance is submitted demonstrating that special conditions and circumstances exist which are peculiar to the land, structure, or buildings in the same district; that literal interpretation of the provisions of this regulation would deprive the applicant of rights commonly enjoyed by other properties in the same district under the terms of this regulation; that the special conditions and circumstances do not result from the actions of the applicant, and that granting the variance requested will not confer on the applicant any special privilege that is denied by this regulation to other lands, structures, or buildings in the same district.

4. No nonconforming use of neighboring lands, structures, or buildings in the same district, and no permitted or nonconforming use of lands, structures, or buildings in other districts shall be considered grounds for the issuance of a variance.

5. Notice of public hearing shall be given as in Section 504; the public hearing shall be held. Any party may appear in person, or by agent or by attorney; the County Board of Adjustment shall make findings that the requirements of this section have been met by the applicant for a variance; the County Board of Adjustment shall further make a finding that the reasons set forth in the application justify the granting of the variance, and that the variance is the minimum variance that will make possible the reasonable use of the land, building or structure; the County Board of Adjustment shall further make a finding that the granting of the variance will be in harmony with the general purpose and intent of this regulation, and will not be injurious to the neighborhood, or otherwise detrimental to the public welfare.

6. In granting any variance, the County Board of Adjustment may prescribe appropriate conditions and safeguards in conformity with this regulation. Violation of such conditions and safeguards, when made a part of the terms under which the variance is granted, shall be deemed a violation of this regulation and punishable under the terms of this regulation.

7. Under no circumstances shall the County Board of Adjustment grant a variance to allow a use not permissible under the terms of this regulation in the district involved, or any use expressly or by implication prohibited by the terms of this regulation in said district.

8. A variance that is granted but not used within one (1) year shall be considered invalid unless an extension has been requested and approved by the Board of Adjustment.

9. The affirmative vote of two-thirds (2/3), five (5) votes, of the full membership of the Board of Adjustment is required to approve a variance.

10. Limitations. Any order of the Board of Adjustment granting a variance may be declared invalid by the Board of Adjustment unless substantially completed within two years from the date of such order. The Zoning Officer shall notify the property owner of record upon invalidation of a variance. [Ord. 2004-1]

Section 506. Board of Adjustment has Powers of Administrative Officer on Appeals. Reversing Decision of Administrative Officer. In exercising the above-mentioned powers, the Board of Adjustment may reverse or affirm, wholly or partly, or may modify the order, requirement, decision or determination appeal from, and may make such order, requirement, decision or determination as ought to be made, and to that end shall have all the powers of the officer from whom the appeal is taken. [Ord. 2004-1]

Section 507. Appeals to a Court of Record. Any person or persons, jointly or severally aggrieved by a decision of the Board of Adjustment or any taxpayer, landowner, or any officer, department, board, or bureau of the County may appeal as provided by State law. [Ord. 2004-1]

ARTICLE VI
DUTIES OF COUNTY ZONING OFFICER, BOARD OF ADJUSTMENT, AND COURTS ON MATTERS OF APPEAL

It is the intent of this regulation that all questions of interpretation and enforcement shall be first presented to the County Zoning Officer, and that such questions shall be presented to the County Board of Adjustment only on appeal from the decision of the Zoning Officer, and that recourse from the decision of the County Board of Adjustment shall be to the courts as provided by law. [Ord. 2004-1]

ARTICLE VII
SCHEDULE OF FEES, CHARGES, AND EXPENSES

Section 701. The Board of County Commissioners shall establish a schedule of fees, charges, and expenses and a collection procedure for building permits, certificates of zoning compliance, appeals, and other matters pertaining this Ordinance. The schedule of fees shall be posted in the office of the County Zoning Officer and may be altered or amended only by the Board of County Commissioners.

Until all applicable fees, charges, and expenses have been paid in full, no action shall be taken on any application or appeal. [Ord. 2004-1]

ARTICLE VIII
ENFORCEMENT

Section 801. Enforcing Officer. The provisions of this regulation shall be administered and enforced by a County Zoning Officer appointed by the Board of County Commissioners, who shall have the power to make inspection of building or premises necessary to carry out his duties in the enforcement of this regulation. [Ord. 2004-1]

Section 802. Right-of-Entry.

Whenever necessary to make an inspection to enforce any of the provisions of this regulation, or whenever the Zoning Officer or an authorized representative has reasonable cause to believe that there exists in any building or upon any premises a regulation violation, the Zoning Officer or an authorized representative may enter such building or premises at all reasonable times to inspect the same or to perform any duty imposed upon the Zoning Officer by this ordinance, provided that if such building or premises be occupied, they shall first present proper credentials and request entry; and if such building or premises be unoccupied, they shall first make a reasonable effort to locate the owner or other persons having charge or control of the building or premises and request entry. If such entry is refused, the Zoning Officer or an authorized representative shall have recourse to every remedy provided by law to secure entry.

When the Zoning Officer or an authorized representative shall have first obtained a proper inspection warrant or other remedy provided by law to secure entry, no owner or occupant or any other persons having charge, care or control of any building or premises shall fail or neglect, after proper request is made as herein provided, to promptly permit entry therein by the Zoning Officer or an authorized representative for the purpose of inspection and examination pursuant to this regulation. [Ord. 2004-1]

Section 803. Stop Order

Whenever any work is being done contrary to the provisions of this ordinance, the Zoning Officer may order the work stopped by notice in writing served on any persons engaged in the doing or causing such work to be done, and any such persons shall forthwith stop such work until authorized by the Zoning Officer to proceed with the work. [Ord. 2004-1]

Section 804. Occupancy Violation.

Whenever any building or structure regulated by this ordinance is being used contrary to the provisions of this ordinance, the Zoning Officer may order such use discontinued and the structure, or portion thereof, vacated by notice served on any person causing such use to be continued. Such persons shall discontinue the use within the time prescribed after receipt of such notice to make the structure, or portion thereof, comply with the requirements of this ordinance. [Ord. 2004-1]

Section 805. Building Permit.

1. Building Permit Required. It shall be unlawful to commence the excavation for or the construction of any building or any accessory building, or to commence the moving or alteration of any buildings, including accessory buildings, until the County Zoning Officer has issued a building permit for such work. Furthermore, it shall be unlawful to commence work until the building permit is displayed in a conspicuous place visible from public right-of-way.

2. Issuance of a Building Permit. In applying to the County Zoning Officer for a building permit, the applicant shall submit a dimensioned sketch or a scale plan indicating the shape, size, and height and location of all buildings, to be erected, altered, or moved and of any building already on the lot. He shall also state the existing and intended use of all such buildings, the location of existing or proposed water and sewer facilities, and supply such other information as may be required by the County Zoning Officer for determining whether the provisions of this regulation are being observed. If the proposed excavation or construction as set forth in the application are in conformity with the provisions of this regulation, and other regulations of the County then in force, the County Zoning Officer shall issue a building permit for such excavation or construction. If a building permit is refused, the County Zoning Officer shall state such refusal in writing, with the cause, and shall immediately thereupon mail notice of such refusal to the applicant at the address indicated upon the application. The County Zoning Officer shall grant or deny the permit within a reasonable time from the date the application is submitted.

3. The issuance of a building permit shall, in no case, be construed as waiving any provisions of this regulation. A building permit shall become void six (6) months from the date of issuance unless substantial progress has been made by that date on the project described therein. If the work described in any building permit has not begun within one hundred and eighty (180) days or has not been substantially completed within one (1) year of the date of issuance thereof, said permit shall expire; it shall be canceled by the Zoning Officer and written notice thereof shall be given to the persons affected. The notice shall state that further work as described in the canceled permit shall not proceed unless, and until, a new building permit has been obtained. [Ord. 2004-1]

Section 806. Construction and Use to be as Provided in Application, Plans, Permits, and Application for Zoning Compliance.

Building permits issued on the basis of plans and applications approved by the Zoning Officer authorize only the use, arrangement, and construction set forth in such approved plans and applications, and no other use, arrangement or construction. Use, arrangement, or construction at variance with that authorized shall be deemed a violation of this ordinance, and punishable as provided by Section 808 of this regulation. [Ord. 2004-1]

Section 807. Complaints Regarding Violations.

Whenever a violation of this Ordinance occurs, or is alleged to have occurred, any person may file a complaint. Such complaint stating fully the causes and basis thereof shall be filed with the Zoning Officer. The Zoning Officer shall record properly such complaint with the Board of Adjustment and investigate and take action thereon as provided by this Ordinance.

If the Zoning Officer shall find that any of the provisions of this Ordinance are being violated, he/she shall notify, in writing by certified mail with return receipt, the person responsible for such violations, indicating the nature of the violation and ordering the action necessary to correct it. The party responsible for the violation shall respond within seven (7) working days from receipt of the letter; otherwise, they will be considered in violation and punishable under Section 808. [Ord. 2004-1]

Section 808 Violation and Penalty.

It is declared unlawful for any person to violate any of the terms and provisions of these regulations or other official control adopted by the Board of County Commissioners pursuant thereto.

In the event of a violation or a threatened violation of these regulations or restrictions, the Board of County Commissioners or any member thereof, in addition to other remedies, may institute an appropriate action or proceeding to seek an injunction in a court of competent jurisdiction to prevent, restrain, correct or abate such violation or threatened violation, and it is the duty of the State's Attorney to institute such action.

Any taxpayer of the County may institute mandamus proceedings in Circuit Court to compel specific performance by the proper official or officials of any duty required by these regulations. [Ord. 2004-1]

ARTICLE IX
AMENDMENTS

Section 901. Petition by Individual Landowner or by County for Zoning Change -- Notice to Abutting Landowners. An individual landowner may petition the Board to change the zoning of all or any part of his property. The Board of County Commissioners may from time to time on its own motion, after public notice and hearing, and after a recommendation by the Planning Commission amend, supplement, or change the boundaries or regulations herein or subsequently established. Such petitioning landowner or County Commission, if rezoning is initiated by the County, shall also notify all other abutting landowners by registered or certified mail of the petitioned zoning change at least seven (7) days prior to any public hearing held thereon by the Board of County Commissioners (Board). Property shall be considered as abutting even though it may be separated from the property of the petitioner by a public road or highway. [Ord. 2004-1]

Section 902. Hearing by Planning Commission on Proposed Change -- Publication of Notice. Upon such filing or upon separate request by the Board, the Planning Commission shall hold a public hearing not less than ten (10) days after notice published in a newspaper of the county. At such public hearing, any person may appear and request or protest the requested change. The Planning Commission shall consider all applications for zoning district classification changes and make a recommendation to the Board of County Commissioners. [Ord. 2004-1]

Section 903. Hearing by County Commissioners. Following receipt of the recommendation of the Planning Commission, the Board shall hold a public hearing after notice in a newspaper of general circulation. The County Auditor shall give notice of the time and place of hearing once at least ten (10) days in advance by publication in a legal newspaper of the county. At such public hearing, any person may appear and request or protest the requested change. [Ord. 2004-1]

Section 904. Adoption or Rejection by County Commissioners -- Publication of Change. The Board of County Commissioners shall thereafter by ordinance, either adopt or reject such amendment, supplement, change, modification or repeal, and if it is adopted by the Board of County Commissioners, the Board shall publish a notice of the fact of once in the official newspaper in such County and take effect on the twentieth (20th) day after its publication. [Ord. 2004-1]

Section 905. Reapplication. No application requesting a zoning district classification change on any property whose application includes any such property either entirely or substantially the same as that which has been denied by the Board, shall again be considered by the Planning Commission before the expiration of six (6) months from the date of the final action of the Board. [Ord. 2004-1]

ARTICLE X
LEGAL STATUS PROVISIONS

Section 1001. Separability. Should any article, section or provision of this regulation be declared by the courts to be unconstitutional or invalid, such decision shall not affect the validity of this regulation as a whole, or any part thereof, other than the part so declared to be unconstitutional or invalid. [Ord. 2004-1]

Section 1002. Purpose of Catch Heads. The catch heads appearing in connection with the foregoing sections are inserted simply for convenience, to serve the purpose of an index and they shall be wholly disregarded by any person, officer, court or other tribunal in construing the terms and provisions of this regulation. [Ord. 2004-1]

Section 1003. Effective Date. This regulation shall take effect and be in force from and after its passage and publication according to law. [Ord. 2004-1]

ARTICLE XI
ZONING DISTRICTS

Section 1101. "A" Agricultural District

Section 1101.01 Purpose.

This district is established to maintain and promote farming and related activities within an environment which is generally free of other land use activities. Residential development will be discouraged to minimize conflicts with farming activities and reduce the demand for expanded public services and facilities. [Ord. 2004-1]

Section 1101.02 Permitted Uses. [Ord. 2004-1 unless otherwise noted]

1. Agricultural activities and farm related buildings, including Type E Concentrated Animal Feeding Operations;
2. Farm dwelling;
3. Site-built Single family residences;
4. Type A and Type B manufactured homes;
5. Modular homes;
6. Animal husbandry service;
7. Fisheries services and game propagation areas;
8. Horticultural services;
9. Orchards, tree farms, truck gardening, nurseries and greenhouses;
10. Public parks and recreation areas;
11. Home occupations.
12. Private Wind Energy Conversion Systems (PWECS).[Ord. 2004-1, Rev. 2004-1G]

Section 1101.03. Conditional Uses. [Ord. 2004-1 unless otherwise noted]

1. Airports and airstrips;
2. Church or cemetery;
3. Golf course, golf driving range;

4. Sand, gravel or quarry operation; Mineral exploration and extraction; Rock crushers, concrete and asphalt mixing plants provided;

    a. The site meets the requirements of the State Department of Environment and Natural Resources.

    b. A site plan is provided indicating the following information:

        i. Present topography, soil types, depth to groundwater.

        ii. Location of existing water drainage, existing buildings, existing shelterbelts.

        iii. Identification of roads leading to the site.

        iv. Proposed changes at the site such as new shelterbelts, new buildings, changes in topography, new fence lines.

        v. Proposed monitoring wells, etc.

        vi. A requirement for receiving a permit for extractive/mining operations shall include a haul-road agreement between the applicant and appropriate governmental entity (Federal, State, County, Township, or Municipality).

        vii. The applicant may be required to provide information regarding how potential air, noise, and water pollution would be minimized.

        viii. A minimum of one thousand (1,000) feet from the mineral exploration and extraction; rock crushers; and concrete and asphalt mixing plants property line to the nearest residence; excluding: the residence of the above said uses operator.

5. Reserved;

6. Reserved;

7. Sanitary landfills, Rubble Sites provided:

    a. The site meets the requirements of the State Department of Water and Natural Resources.

    b. A site plan is provided indicating the following information:

        (1) Present topography, soil types, depth to groundwater.

        (2) Location of existing water drainage, existing buildings, existing shelterbelts.

        (3) Identification of roads leading to the site.

(4) Proposed changes at the site such as new shelterbelts, new buildings, changes in topography, new fence lines.

(5) Proposed monitoring wells, etc.

c. A minimum of one thousand (1,000) feet from the landfill property line to the nearest residence; excluding: the residence of the landfill operator.

8. Institution farms, including religious farming communities;

9. Domestic Sanitary Sewer Treatment Facility provided;

a. The site meets the requirements of the State Department of Water and Natural Resources.

b. A site plan is provided indicating the following information:

(1) Present topography, soil types, depth to groundwater.

(2) Location of existing water drainage, existing buildings, existing shelterbelts.

(3) Identification of roads leading to the site.

(4) Proposed changes at the site such as new shelterbelts, new buildings, changes in topography, new fence lines.

(5) Proposed monitoring wells, etc.

c. A minimum of one thousand (1,000) feet from the domestic sanitary sewer treatment facility property line to the nearest residence.

10. Class A, Class B, Class C, and Class D Concentrated Animal Feeding Operations. (See Concentrated Animal Feeding Operations, Article XIII.)

11. Stables;

12. Veterinary clinics;

13. Junkyards/salvage yards, provided that they meet the following minimum requirements and other restrictions that the Board of Adjustment may deem appropriate:

a. Storage for junkyards shall be set back a minimum of two hundred (200) feet from any adjoining road right-of-way.

b. Junkyards shall be screened on all sides by a solid wall, with construction materials and design to be approved by the Board of Adjustment, at least two (2) feet above the highest stock pile or by a shelterbelt of shrubs and trees as approved by the Board of Adjustment; screening must be maintained in good repair.

c. No junkyards will be allowed within one thousand (1,000) feet from the junkyard property line to the nearest residence; excluding: the residence of the junkyard operator.

d. All junkyards must have a minimum lot of ten (10) acres.

14. Water pumping stations, elevated tanks and similar essential public utilities and service structures;

15. Wireless Telecommunication Towers and Facilities;

16. Commercial public entertainment enterprises not normally accommodated in commercial areas, including but not limited to, the following: music concerts, rodeos, tractor pulls, and animal and vehicle races;

17. Seasonal retail stands, including fireworks stands;

18. Home extended business--see Section 1209;

19. Caretaker residences associated with public or private enterprise.

20. Game Lodge;

21. Private Shooting Preserve;

22. Wind Energy System;

23. On-Site Sign;

24. Kennel.

25. Agribusiness Activities [Ord.2016-01B]

Section 1101.04. Area Regulations. [Ord. 2004-1 unless otherwise noted]

1. Lot Size: All residential lots shall be a minimum of two (2) acres, not counting the road right-of-way. All other permitted uses and conditional uses shall have a minimum area and setback regulations as determined by the Board of Adjustment.

2. Front Yard

The minimum depth of the front yard shall be not less than one hundred (100) feet and in no case shall an accessory building be located or extend into the front yard. In the case of a corner lot, front yards shall be provided on both streets.

2. Side Yard

There shall be a side yard on each side of building having a width of not less than fifty (50) feet.

3. Rear Yard

   There shall be a rear yard having a depth of not less than fifty (50) feet or twenty percent (20%) of the depth of the buildable lot at the time of the passage of this Ordinance.

4. Intensity of Use

   a. Each buildable lot must be at least two (2) acres not counting the road right-of-way.

   b. All buildings shall be set back from road right-of-way lines and lot line to comply with the above yard requirements.

5. Minimum Lot Area Requirements

   a. The minimum lot area requirement for a Class A, B, or C, concentrated animal feeding operation (CAFO) established after June 9, 2016 shall be (80) acres. [Ord 2004-1, Rev. 2004-1B, Rev 2016-01A]

   b. The minimum lot area requirement for a Class A, B, C, D or E concentrated animal feeding operation not vested in accordance with Section 1305 shall be (80) acres. [Ord. 2016-01A]

Section 1101.05. Height Regulations. [Ord. 2004-1]

No main buildings shall exceed two and one-half (2 1/2) stories or thirty-five (35) feet in height. Exceptions include the following:

1. Agricultural buildings;

2. Chimneys, smokestacks, cooling towers;

3. Radio and TV towers;

4. Water tanks;

5. Elevators;

6. Others, providing that they are not used for human occupancy.

Section 1101.06. Access. [Ord. 2004-1]

1. The drive-way serving the parcel shall be separated from adjacent driveways on the same side of the road by the following distances depending upon road types:

   a. Local road: 100 feet;

   b. Collector road: 300 feet;

   c. Arterial: 500 feet;

d. Minimum distance from intersection of two or more of the above: 100 feet

2. For all proposed uses and structures adjacent to a State highway, an access permit from the State of South Dakota Department of Transportation shall be required prior to the filing of a plat or the issuance of a building/use permit.

Section 1101.07. Easements/Waivers. [Ord. 2004-1 unless otherwise noted]

1. An Agricultural easement must be filed with Register of Deeds on all property to be used as a site for a newly constructed residence (farm and non-farm) or church prior to issuance of a building permit.

2. Applicants for residential development (farm and non-farm) are required to obtain a written waiver from the owner/operator of any existing concentrated animal feeding operation which is closer than one-half (1/2) mile from the proposed residential building site. This waiver shall be filed with the Register of Deeds. In the event the owner/operator of the existing concentrated animal feeding operation refuses to sign the waiver, the applicant for the residential development shall sign a separate easement to be attached to the property. The easement waives the applicant's and subsequent owner's common law rights to object to the existing concentrated animal feeding operation's potential need for a variance from the setback requirements of the Grant County Zoning Ordinance. [Ord. 2004-1, Rev. 2004-1D]

Section 1102. "CI" Commercial/Industrial District

Section 1102.01. Purpose [Ord. 2004-1]

The "CI" District is intended for commercial and industrial uses which due to their size and nature require highway access.

Section 1102.02. Permitted Uses. [Ord. 2004-1]

1. On-Site Signs

Section 1102.03. Conditional Uses. [Ord. 2004-1 unless otherwise noted]

1. Implement sales and service;

2. Truck terminals and freight warehouses;

3. Seed sales and grain storage, fertilizer and chemical storage and sales;

4. Highway and street maintenance shops;

5. Welding and machine shops;

6. Gas, oil and liquid propane stations including bulk stations;

7. Public and private utilities;

8. Livestock sales;

9. Contractors' shops and yards;

10. Wholesale distributing companies;

11. Restaurants;

12. Motels;

13. Single family residences;

14. Adult Uses;

15. Mining operations.

16. Off-site signs

17. Day Care Center (See section 1214.) [Ord. 2004-1K]

Section 1102.04. Area Regulations. [Ord. 2004-1]

1. Lot Area. Lot area shall be determined by need, setback, side yards, rear yards, parking requirements, freight handling requirements, building site and future expansion; however, in no case shall a lot have less than two (2) acres. An applicant for a conditional use shall provide a proposed site plan which can be reviewed by the Board of Adjustment. For commercial and industrial uses, buildings shall occupy no more than twenty-five (25) percent of the lot.

2. Front Yard. There shall be a front yard on each street which a lot abuts, and which yard shall be not less than one hundred (100) feet in depth.

3. Side Yards. On lots adjacent to a residential area, all buildings and incidental areas shall be located so as to provide a minimum side yard of one hundred (100) feet, which shall be landscaped on the side adjacent to the residential area. All other side yards shall be a minimum of fifty (50) feet.

4. Rear Yards. No building shall be constructed within fifty (50) feet of the rear lot line. The rear yard shall be one hundred (100) feet if the lot abuts an interstate or major highway. [Ord. 2004-1]

Section 1102.05. Access. [Ord. 2004-1]

1. The drive-way serving the parcel shall be separated from adjacent driveways on the same side of the road by the following distances depending upon road types:

    a. Local road: 100 feet;

    b. Collector road: 300 feet;

    c. Arterial: 500 feet;

    d. Minimum distance from intersection of two or more of the above: 100 feet

2. For all proposed uses and structures adjacent to a State highway, an access permit from the State of South Dakota Department of Transportation shall be required prior to the filing of a plat or the issuance of a building/use permit [Ord. 2004-1]

Section 1103. "NR" Natural Resource District

Section 1103.01. Purpose. [Ord. 2004-1]

The purpose of the Natural Resource District is to provide for the retaining of natural vegetation of a particular area, to preserve the natural environment and resources from destructive land uses and to protect wildlife habitat. Such an area may include but is not limited to flood plains of rivers, streams, and lakes, abandoned quarries, certain wetlands, natural prairies, and historical sites. [Ord. 2004-1]

Section 1103.02. Area Contained in "NR" District. [Ord. 2004-1]

All lands, unless otherwise zoned, within three hundred (300) feet of wetlands that are totally or partially owned by the State or Federal governments as wildlife production or public shooting areas and meandered lakes. [Ord. 2004-1]

Section 1103.03. Permitted Uses. [Ord. 2004-1]

1. Wildlife production areas;

2. Game refuges;

3. Historic sites and/or monuments;

4. Designated natural prairies;

5. Public hunting and fishing access areas.

6. Horticulture uses and livestock grazing. [Ord. 2004-1]

Section 1103.04. Uses Permitted by Conditional Use if Deemed Not Detrimental to District. [Ord. 2004-1]

1. Transportation and utility easements and rights-of-way.

2. Utility substations;

2. Public parks and/or playgrounds; [Ord. 2004-1]

Section 1104. "PD" Planned Development Project District

Section 1104.01. Purpose.

A Planned Development Project District may deviate from adherence to certain regulations for individual lot development, and may be permitted in those districts where it is designated as a conditional use under district regulations, or may be permitted in any district after an amendment to the Official Zoning Map of this Resolution. Projects shall contain a minimum of five (5) acres. [Ord. 2004-1]

Section 1104.02. Procedure:

When a Planned Development Project District is proposed, a Preliminary Plat and Final Plat, both approved by the Planning Commission shall be required for every Planned Development Project District. The project shall be developed according to the approved Final Plat. Building permits shall be required for each building. [Ord. 2004-1]

Section 1104.03. Uses:

The uses of premises in a Planned Development Project District shall conform with the permitted uses of the district in which it is located when it is permitted as a conditional use. If a proposed Planned Development Project District includes mixed uses or other uses that are not permitted in the district where it is proposed or uses not permitted in any district, the project may be permitted after an amendment to the Official Zoning Map designating the proposed location as a Planned Development Project District as provided in Article IX of this Resolution. The amendment may be made after the conditional approval of the Preliminary Plat and shall be valid only for that project as approved. [Ord. 2004-1]

Section 1104.04. Standards:

In any Planned Development Project District, it is permissible to depart from adherence to individual lot dimensions and area regulations; provided, however, that there shall be no diminution of the total equivalent lot area, parking area, and loading and unloading area requirements that would be necessary for the equivalent amount of individual lot development. The County Planning Commission may permit reductions in said requirements; provided, however, that upon proof by the developer efficiencies of large scale are present which permit such reductions without destroying the intent of this Resolution. [Ord. 2004-1]

Section 1104.05. Conditions.

The County Planning Commission shall attach reasonable conditions to insure that there shall be no departure from the intent of this Ordinance. The Planned Development Project District shall conform with all such conditions. Such conditions shall be flexible. The following standards define the typical conditions the County Planning Commission shall attach in addition to the standards for lot, parking, and loading and unloading area as provided above.

1. Access points to all County and State roads shall be located no more frequently than once every one-eighth (1/8) mile.

2. A buffer area of open space or protective planting which will protect each use from the undesirable effects of the other shall separate different land uses.

3. Parking, public streets, and other public areas used at night shall be adequately lighted, and residential areas shall be adequately protected from such lighting and any other lighting from such parking, public streets, and public uses.

4. Construction of all Planned Development Project Districts shall be initiated within one (1) year after approval of the Final Plat.

5. Developers of a Planned Development Project District shall provide the Planning Commission with any covenants to be placed upon the proposed District prior to the approval of a Planned Development Project District. [Ord. 2004-1]

Section 1105. Aquifer Protection Overlay District

Section 1105.01. Purpose and Intent:

The Grant County Zoning Commission recognizes (1) that residents of Grant County rely exclusively on ground water for a safe drinking water supply and (2) that certain land uses in Grant County can contaminate ground water particularly in shallow/surficial aquifers.

The purpose of the Aquifer Protection Overlay District is to protect public health and safety by minimizing contamination of the shallow/surficial aquifers of Grant County.

It is the intent to accomplish aquifer protection, as much as possible, by public education and securing public cooperation. Appropriate land use regulations will be imposed, however, which are in addition to those imposed in the underlying zoning districts or in other county regulations. Any use existing at the time these regulations are adopted is grandfathered. [Ord. 2004-1]

Section 1105.02. Definitions for Aquifer Protection Overlay District: [Ord. 2004-1 unless otherwise noted]

1. Reserved [Ord. 2004-1, Rev. 2016-01]

2. Reserved [Ord. 2004-1, Rev. 2016-01]

3. Reserved [Ord. 2004-1, Rev. 2016-01]

4. Chemigation: The process of applying agricultural chemicals (fertilizer or pesticides) through an irrigation system by injecting the chemicals into the water.

5. Class V Injection Well: A conduit through which potentially contaminated but generally non-hazardous fluids can move below land surface into or above an aquifer. The types of primary concern in Grant County are 5W20-industrial process water and waste disposal wells and 5X28-automobile service station disposal wells. Typically 5W20 types are commercial/ industrial facility septic tanks used to dispose of more than domestic wastewater. 5X28 types are dry wells for wastes from repair bay drains at facilities servicing internal combustion vehicles and equipment.

6. Contamination: The process of making impure, unclean, inferior or unfit for use by introduction of undesirable elements.

7. Contingency Plans: Detailed plans for control, containment, recovery and clean up of hazardous materials released during floods, fires, equipment failures, leaks and spills.

8. Development: The carrying out of any surface or structure construction, reconstruction or alteration of land use or intensity of use.

9. Facility: Something built, installed or established for a particular purpose.

10. Hazardous Materials: A material which is defined in one or more of the following categories:

    a. Ignitable: A gas, liquid or solid which may cause fires through friction, absorption of moisture, or which has low flash points. Examples: white phosphorous and gasoline.

    b. Carcinogenic: A gas, liquid or solid which is normally considered to be cancer causing or mutagenic. Examples: PCBs in some waste oils.

    c. Explosive: A reactive gas, liquid or solid which will vigorously and energetically react uncontrollably if exposed to heat, shock, pressure or combinations thereof. Examples: dynamite, organic peroxides and ammonium nitrate.

    d. Highly Toxic: A gas, liquid or solid so dangerous to man as to afford an unusual hazard to life. Examples: parathion and chlorine gas.

    e. Moderately Toxic: A gas, liquid or solid which through repeated exposure or in a single large dose can be hazardous to man. Example: atrazine.

    f. Corrosive: Any material, whether acid or alkaline, which will cause severe damage to human tissue, or in case of leakage might damage or destroy other containers of hazardous materials and cause the release of their contents. Examples: battery acid and phosphoric acid.

11. Reserved [Ord. 2004-1, Rev. 2016-01]

12. Leaks and Spills: Any unplanned or improper discharge of a potential contaminant including any discharge of a hazardous material.

13. Pasture: A field that provides continuous forage to animals and where the concentration of animals is such that a vegetative cover is maintained during the growing season.

14. Primary Containment Facility: A tank, pit, container, pipe or vessel of first containment of a liquid or chemical.

15. Secondary Containment Facility: A second tank, catchment pit, pipe or vessel that limits and contains a liquid or chemical leaking or leaching from a primary containment area; monitoring and recovery systems are required.

16. Reserved [Ord. 2004-1, Rev. 2016-01]

17. Ten Year Time of Travel Distance: The distance that ground water will travel in ten years. This distance is a function of aquifer permeability and water table slope.

18. Zone of Contribution: The entire area around a well or wellfield that contributes water to the well or wellfield.

Section 1105.03. Delineation and Regulation of Aquifer Protection Overlay Zones

Boundaries for the aquifer protection zones for the Aquifer Protection Overlay District are shown on maps prepared by the East Dakota Water Development District (EDWDD), Brookings, South Dakota. Said maps are hereby adopted by reference as part of these regulations as if the maps were fully described herein.

The Aquifer Protection Overlay District is divided into two zones. The critical impact zone, Zone A, was mapped by the East Dakota Water Development District with South Dakota Geological Survey (SDGS) technical assistance using techniques outlined in the U.S. Environmental Protection Agency publication "Guidelines for Delineation of Wellhead Protection Areas", June, 1987. The shallow/surficial aquifer boundary for Zone B was mapped by the South Dakota Geological Survey. [Ord. 2004-1]

Section 1105.04. Zone A -- Aquifer Critical Impact Zones

Zone A, the wellhead protection area, is the mapped zone of contribution around all public water supply wells or wellfields in shallow/surficial aquifers and includes land upgradient from the well or wellfield to the ten year time of travel boundary. [Ord. 2004-1]

Section 1105.05. Permitted Uses in Zone A: [Ord. 2004-1 unless otherwise noted]

The following uses are permitted provided they meet appropriate performance standards outlined for aquifer protection overlay zones:

1. Agriculture;

    a. Application of manure is permitted with approved nutrient management plan.

2. Horticulture;

3. Parks, greenways or publicly owned recreational areas;

4. Necessary public utilities/facilities designed so as to prevent contamination of groundwater.

5. Single family residences on lots of five (5) acres or more.

6. All “Permitted Uses” listed in the underlying district(s) which do not pose a potential risk to groundwater resources and are not a prohibited use. [Ord. 2004-1, Rev. 2016-01]

Section 1105.06. Conditional Uses in Zone A: [Ord. 2004-1 unless otherwise noted]

The following uses are permitted only under the terms of a conditional use and must conform to provisions of the underlying zoning district and meet Performance Standards outlined for Aquifer Protection Overlay Zones.

1. Expansion, modification, alteration, or relocation of existing uses to the extent they remain or become nonconforming and to the extent allowed by the underlying district. The Board of Adjustment shall not grant approval unless it finds the proposed expansion does not pose greater potential for groundwater contamination than the existing use. [Ord. 2004-1, Rev. 2016-01]

2. All uses permitted by conditional use in the underlying districts which do not pose a potential risk to groundwater resources and are not a prohibited use and provided they can meet Performance Standards outlined for the Aquifer Protection Overlay Zones. [Ord. 2004-1, Rev. 2016-01]

Section 1105.07. Prohibited Uses in Zone A: [Ord. 2004-1 unless otherwise noted]

The following uses are expressly prohibited in Zone A:

1. New Concentrated Animal Feeding Operations and the expansion of any existing Class A, Class B, Class C, Class D, and Class E. [Ord. 2004-1, Rev. 2016-01]

2. Manure storage areas except above ground tanks;

3. Disposal of solid waste except spreading of manure;

4. Outside unenclosed storage of road salt;

5. Disposal of snow containing de-icing chemicals;

6. Processing and storage of PCB contaminated oil;

7. Car washes;

8. Auto service, repair or painting facilities and junk or salvage yards;

9. Disposal of radioactive waste;

10. Graveyards or animal burial sites;

11. Detonation sites;

12. Open burning except ditches, fields and non-hazardous yard and household wastes such as paper, wood and leaves.

13. Fall application of nitrogen fertilizer except spreading of manure;

14. Land spreading of petroleum contaminated soil;

15. Land spreading or dumping of waste oil;

16. Industrial process water and waste disposal wells-5W20 type Class V injection wells;.

17. Automobile service station disposal wells-5X28 type Class V injection wells;.

18. All other facilities involving the collection, handling, manufacture, use, storage, transfer or disposal of any solid or liquid material or waste having a potentially harmful impact on ground water quality.

19. Existing Concentrated Animal Feeding Operations will not be able to expand beyond a total of 99 animal units.

Section 1105.08. Zone B -- Aquifer Secondary Impact Zones

Zone B is the remainder of the mapped shallow/surficial aquifer in the County not included in Zone A. Zone B also includes any delineated lands adjacent to Zone A not underlain by the shallow aquifer but with sufficient slope that contaminated surface water could flow directly onto Zone A.

Zone B is being protected because (1) the aquifer is a valuable natural resource for future development, (2) the aquifer provides drinking water supply for individual domestic users, (3) contamination is not justified just because this area is not currently used for public water supply and (4) contaminants from this area could eventually enter Zone A. [Ord. 2004-1]

Section 1105.09. Permitted Uses in Zone B:

1. All "Permitted Uses" listed in the underlying zoning districts which do not pose a potential risk to groundwater resources and are not a prohibited use and provided that they can meet the Performance Standards as outlined for the Aquifer Protection Overlay Zones and are not a prohibited use. [Ord. 2004-1, Rev. 2016-01]

Section 1105.10. Conditional Uses in Zone B: [Ord. 2004-1 unless otherwise noted]

The following uses are permitted only under the terms of a conditional use and must conform to provisions of the underlying zoning district and meet Performance Standards outlined for Aquifer Protection Overlay Zones. [Ord. 2004-1, Rev. 2016-01]

1. All uses permitted by conditional use in the underlying districts, which do not pose a potential risk to groundwater resources and are not a prohibited use and, provided they can meet Performance Standards outlined for the Aquifer Protection Overlay Zones. [Ord. 2004-1, Rev. 2016-01]

2. Earthen storage basins and lagoons may be approved by the Board of Adjustment after site specific review. The Board reserves the right to require an impermeable liner to prevent ground water contamination.

3. Expansion of existing Class D Concentrated Animal Feeding Operations (Existing as of Date of Adoption of the Ordinance) not to exceed a cumulative total of three hundred (300) animal units. Said expansion or alteration must be constructed according to the Department of Environment and Natural Resources State General Permit criteria and shall apply for said General Permit. The County shall require soil borings to determine impermeable material between land surface and the aquifer. [Ord. 2004-1, Rev. 2016-01]

4. Stockpiling of solid waste. [Ord. 2016-01]

5. Expansion, modification, alteration, or relocation of existing permitted or conditional uses to the extent they remain or become nonconforming and to the extent allowed by the underlying district. The Board of Adjustment shall not grant approval unless it finds the proposed expansion does not pose greater potential for groundwater contamination than the existing use. [Ord. 2016-01]

Section 1105.11. Prohibited Uses in Zone B: [Ord. 2004-1 unless otherwise noted]

The following uses are expressly prohibited in Zone B:

a. Fall application of nitrogen fertilizer on the following soil types: Arvilla, Divide, Estelline, Fordville, Renshaw, and Sioux;

b. Land spreading of petroleum contaminated soil;

c. Land spreading or dumping of waste oil;

d. Industrial process water and waste disposal wells-5W20 type Class V injection wells;

e. Automobile service station disposal wells-5X28 type Class V injection wells.

f. New Concentrated Animal Feeding Operations of Class A, Class B, and Class C, or expansions of existing Class D concentrated animal feeding operations which cannot meet performance standards. [Ord. 2016-01]

Section 1105.12. Performance Standards For Aquifer Protection Overlay Zones:

The following standards shall apply to land uses in Zones A and B of the Aquifer Protection Overlay Districts:

1. New or replacement septic tanks and associated drain fields for containment of human wastes must conform with regulations established by the State Department of Environment and Natural Resources.

2. Commercial or industrial liquid waste ponds containing any solid or liquid material or waste will not be permitted without a secondary containment system except for community wastewater lagoons.

3. Manure storage areas are permitted in Zone B but must be constructed in conformance with State regulations.

4. Petroleum products stored at one locality in a tank or series of tanks must be elevated; such tanks must have a secondary containment system where it is deemed necessary by the County Zoning Office.

5. Reserved.

6. New feedlots in Zone B shall meet the Concentrated Animal Feeding Operation regulations in Article VIII.

7. Discharge of industrial process water is prohibited without County Zoning Office approval.

8. Auto service, repair or painting facilities and junk or salvage yards shall meet all State and Federal standards for storage, handling and disposal of petroleum products and shall properly dispose of all other potentially hazardous waste materials.

9. Any facility required to file material safety data sheets as part of SARA Title III must prepare and have on file in the County Zoning Office an acceptable contingency plan for preventing hazardous chemicals from contaminating the shallow/surficial aquifer. Agricultural operations are exempt unless than have more than 10 employees.

10. Any commercial or industrial facility involving collection, handling, manufacture, use, storage, transfer or disposal of hazardous materials, in excess of 1000 pounds or 100 gallons, must be constructed to prevent hazardous materials from contaminating the shallow/surficial aquifer should equipment failure, floods, fire or other natural catastrophes occur. Stored petroleum products are exempt from this performance standard. Facilities must meet the following minimum specifications:

    a. For flood control, all underground facilities shall include a monitoring system and a secondary standpipe above the 100- year frequency flood level. All above ground facilities, an impervious dike, above the 100- year flood level and capable of containing 120 percent of the largest storage volume, with an overflow recovery catchment area (sump).

    b. For fire control, all facilities shall include a fire retardant system and provision for dealing safely with both health and technical hazards that may be encountered by disaster control personnel in combating fire. Hazards to be considered are overhead and buried electrical lines, pipes, other buried objects and other hazardous liquids, chemicals or open flames in the immediate vicinity.

    c. For equipment failures, a secondary containment system must be installed to intercept any leak or discharge from the primary containment. A leak detection system and overfill protection system must also be installed. Underground tanks or buried pipes for handling hazardous materials must have double walls and accessible sumps.

11. The County Zoning Office and Department of Environment and Natural Resources shall be informed within 24 hours of any leak, spill or release of materials that might potentially contaminate groundwater.

12. Since it is known that improperly abandoned wells can become a direct conduit for contamination of groundwater by surface water, all abandoned wells should be plugged in conformance with South Dakota Well Construction Standards, Chapter 74:02:04:67-70. [2004-1]

Section 1105.13. Grant of Permit, Alteration of Use:

Before a permit is granted, the County Zoning Officer must examine an application and determine that the proposed use, activity or development meets the provisions of this ordinance.

When securing a use permit, the owner/developer agrees to comply with performance standards in relationship to the applied for permit.
Whenever any person has an existing use, activity or development and thereafter desires alteration or expansion of the authorized use, such persons shall apply for a permit except for the normal upkeep, replacement and repair of existing facilities.

Exceptions:

1. Storage of liquids, chemicals and fertilizers used by an individual or corporation in their agricultural operations during planting and crop cultivation are exempt from the requirements of this ordinance January 1 to October 1. However, Best Management Practices are encouraged.

2. Tanks used for chemigation are exempt from secondary containment regulations but secondary containment is encouraged.

3. Storage of liquid or dry fertilizer in amounts equal to or less than 1,000 pounds or 100 gallons, stored indoors by each farm operator is exempt from the requirements of this ordinance. [Ord. 2004-1]

Section 1105.14. Limitation of County Liability:

Nothing in this ordinance shall be construed to imply that Grant County, by issuing a permit, has accepted any of an owner's or developer's liability if a permitted development contaminates water in shallow/surficial aquifers. [Ord. 2004-1]

Section 1105.15. Underlying Zones:

Underlying zoning restrictions apply along with restrictions set forth in the Aquifer Protection Overlay District. [Ord. 2004-1]

Section 1105.16. Saving Clause:

Should any section or provision of this ordinance be declared invalid, such decision shall not affect the validity of the ordinance as a whole or any other part thereof. [Ord. 2004-1]

Section 1106. Flood Damage Prevention Ordinance [Ord. 2004-1]

A. Purpose:

It is the purpose of this ordinance to promote the public health, safety, and general welfare and to minimize public and private losses due to flood conditions to specific areas by provision designed:

1. To protect human life and health;

2. To minimize expenditure of public money for costly flood control projects;

3. To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;

4. To minimize prolonged business interruptions;

5. To minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in areas of special flood hazard;

6. To help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future flood blight areas;

7. To ensure that potential buyers are notified that property is in an area of special flood hazard; and,

8. To ensure that those who occupy the areas of special flood hazards assume responsibility for their actions.

Methods of Reducing Flood Losses

In order to accomplish its purposes, this ordinance includes methods and provisions for:

1. Restricting or prohibiting uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;

2. Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;

3. Controlling the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel flood waters;

4. Controlling filling, grading, dredging, and other development which may increase flood damage; and

5. Preventing or regulating the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards in other areas.

B. Definitions:

Unless specifically defined below, words or phrases used in this ordinance shall be interpreted so as to give them the meaning they have in common usage and to give this ordinance its most reasonable application.

1. Area of Special Flood Hazard means the land in the floodplain within a community subject to a one percent or greater chance of flooding in any given year.

2. Base Flood means the flood having a one percent chance of being equaled or exceeded in any given year.

3. Development means any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations located within the area of special flood hazard.

4. Flood or Flooding means a general and temporary condition of partial or complete inundation of normally dry land areas from:

   a. The overflow of inland or tidal waters and/or

   b. The unusual and rapid accumulation of runoff of surface waters from any source.

5. Flood Insurance Rate Map (FIRM) means an official map of a community on which the Federal Emergency Management Agency has delineated areas of special flood hazard designated as Zone A.

6. Manufactured Home means a structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when connected to the required utilities. This term also includes park trailers, travel trailers and other similar vehicles placed on a site for greater than 180 consecutive days.

7. Structure means a walled and roofed building or manufactured home that is principally above ground.

8. Substantial Improvement means any repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure either:

   a. Before the improvement or repair is started, or

   b. If the structure has been damaged and is being restored, before the damage occurred. For the purpose of this definition, "substantial improvement" is considered to occur when the first alteration of any walk, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure.

   The term does not, however, include either:

   a. Any project for improvement of a structure to comply with existing State or local health, sanitary, or safety code specifications which are solely necessary to assure safe living conditions, or

   b. Any alteration of a structure listed on the National Register of Historic Places or a State Inventory of Historic Places.

C. General Provisions:

Lands to Which This Ordinance Applies

This ordinance shall apply to all areas of special flood hazards within the jurisdiction of Grant County.

Basis for Establishing the Areas of Special Flood Hazard

The areas of special flood hazard identified by the Federal Emergency Management Agency in its Flood Insurance Rate Map (FIRM), dated February 1, 1987, is adopted by reference and declared to be part of this ordinance. The FIRM is on file at Grant County Courthouse, 210 East Fifth Avenue, Milbank, South Dakota 57252.

Compliance

No structure or land shall hereafter be constructed, located, extended, or altered without full compliance with the terms of this ordinance and other applicable regulations.

Abrogation and Greater Restrictions

This ordinance is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this ordinance and another ordinance, easement, covenant, or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

Interpretation

In the interpretation of this ordinance, all provisions shall be:

1. Considered as minimum requirements;

2. Liberally construed in favor of the governing body; and,

3. Deemed neither to limit nor repeal any other powers granted under State statutes.

Warning and Disclaimer of Liability

The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. This ordinance does not imply that land outside the areas of special flood hazards or uses permitted within such areas of special flood hazards or uses permitted within such areas will be free from flooding or flood damages. This ordinance shall not create liability on the part of Grant County, any officer or employee thereof, or the Federal Emergency Management Agency for any flood damages that result from reliance on this ordinance or any administrative decision lawfully made thereunder.

D. Administration

Establishment of Development Permit

A development permit shall be obtained before construction or development begins within any area of special flood hazard established in the Section BASIS FOR ESTABLISHING AREAS OF SPECIAL FLOOD HAZARD, application for a development permit shall be made on forms furnished by the Zoning Officer and may include, but not be limited to: Plans in duplicate drawn to scale showing the nature, location, dimensions, and elevations of the area in question; existing or proposed structures, fill, storage of materials, drainage facilities; and the location of the foregoing. Specifically, the following information is required:

1. Elevation in relation to mean sea level of the lowest floor (including basement) of all structures;

2. Elevation in relation to mean seal level to which any structure has been floodproofed;

3. Certification by a registered professional engineer or architect that the floodproofing methods for any non-residential structure meet the floodproofing criteria in the Section PROVISIONS FOR FLOOD HAZARD REDUCTION; and

4. Description of the extent to which any watercourse will be altered or relocated as a result of proposed development.

Designation of the Zoning Officer

The Zoning Officer is hereby appointed to administer and implement this ordinance by granting or denying development permit applications in accordance with its provisions.

Duties and Responsibilities of the Zoning Officer

Duties of the Zoning Officer shall include but not be limited to:

1. Permit Review

    a. Review all development permits to determine that the permit requirements of this ordinance have been satisfied.

    b. Review all development permits to determine that all necessary permits have been obtained from those Federal, State or local government agencies from which prior approval is required.

    c. Review all development permits to determine if the proposed development adversely affects the flood carrying capacity of the area of special flood hazard. For the purpose of this ordinance, "adversely affects" means damage to adjacent properties because of rises in flood stages attributed to physical changes of the channel and the adjacent overbank areas.

        i. If it is determined that there is no adverse effect and the development is not a building, then the permit shall be granted without further consideration.

        ii. If it is determined that there is an adverse effect, then technical justification (i.e., a registered professional engineer's certification) for the proposed development shall be required.

        iii. If the proposed development is a building, then the provisions of this ordinance shall apply.

Use of Other Base Flood Data

When base flood elevation data has not been provided in accordance with BASIS FOR ESTABLISHING THE AREAS OF SPECIAL FLOOD HAZARD, the Zoning Officer shall obtain, review, and reasonably utilize any base flood elevation and floodway data available from a Federal, State, or other source as criteria for requiring that new construction, substantial improvements, or other development in Zone A are administered in accordance with SPECIFIC STANDARDS.

Information to be Obtained and Maintained

1. Obtain and record the actual elevation (in relation to mean sea level) of the lowest floor (including basement) of all new or substantially improved structures, and whether or not the structure contains a basement.

2. For all new or substantially improved floodproofed structures:

    a. Verify and record the actual elevation (in relation to mean sea level) to which the structure has been floodproofed.

    b. Maintain the floodproofing certifications required in ESTABLISHMENT OF DEVELOPMENT PERMIT.

3. Maintain for public inspection all records pertaining to the provisions of this ordinance.

Alteration of Watercourses

1. Notify adjacent communities and the Division of Disaster and Emergency Services prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Emergency Management Agency.

2. Require that maintenance is provided within the altered or relocated portion of said watercourse so that the flood carrying capacity is not diminished.

Interpretation of FIRM Boundaries

Make interpretations, where needed, as to the exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions).

E. Provision For Flood Hazard Reduction

General Standards

In all areas of special flood hazards, the following standards are required:

Anchoring

1. All new construction and substantial improvements shall be anchored to prevent flotation, collapse, or lateral movement of the structure and capable of resisting the hydrostatic and hydrodynamic loads.

2. All manufactured homes must be elevated and anchored to resist flotation, collapse or lateral movement and capable of resisting the hydrostatic and hydrodynamic loads. Methods of anchoring may include, but are not limited to use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable State and local anchoring requirements for resisting wind forces. Specific requirements may be:

1. Over-the-top ties be provided at each of the four corners of the manufactured home, with two additional ties per side at intermediate locations, with manufactured homes less than 50 feet long requiring one additional tie per side.

2. Frame ties be provided at each corner of the home with five additional ties per side at intermediate points, with manufactured homes less than 50 feet long requiring four additional ties per side.

3. All components of the anchoring system be capable of carrying a force of 4,800 pounds; and

4. Any additions to the manufactured home be similarly anchored.

Construction Materials and Methods

1. All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.

2. All new construction and substantial improvements shall be constructed using methods and practices that minimize flood damage.

3. All new construction and substantial improvements shall be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

Utilities

1. All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system;

2. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters; and,

3. On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

Subdivision Proposals

1. All subdivision proposals shall be consistent with the need to minimize flood damage;

2. All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize flood damage;

3. All subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage; and,

4. Base flood elevation data shall be provided for subdivision proposals and other proposed development which contain at least 50 lots or 5 acres (whichever is less).

Encroachments

Encroachments, including fill, new construction, substantial improvements, and other development shall be prohibited in any floodway unless a technical evaluation demonstrates that the encroachments will not result in any increase in flood levels during the occurrence of the base flood discharge.

Specific Standards

In all areas of special flood hazards where base flood elevation data has been provided as set forth in USE OF OTHER BASE FLOOD DATA, the following standards are required:

Residential Construction

New construction and substantial improvement of any residential structure shall have the lowest floor (including basement) elevated to or above the base flood elevation.

ARTICLE XII
GENERAL REQUIREMENTS

Pursuant to the purpose of this regulation are certain general requirements that are not provided for under Article XI Zoning Districts. These requirements are set forth under this Article.

Section 1201. Screening. Where any "CI" use is adjacent to any residential district, that use (building, parking or storage) shall be appropriately screened from the residential use by planting, except where planting may be in conflict with vision clearance. [Ord. 2004-1]

Section 1202. Vision Clearance on Corner Lots. On a corner lot in any district, no fence, building or other structure shall be erected to a height of more than three (3) feet above the elevation of the established grade at the intersection of the streets on that part of any yard which is bounded by the street lines of the intersecting streets, either at the intersection of said street lines or within such area. [Ord. 2004-1]

Section 1203. Refuse. In all zoning districts, refuse (rubbish, garbage, trash, wastes, or debris) shall be kept within a complete enclosed building or specially designed closed container made for such purpose. Owners of vacant lot shall be responsible for keeping their property free of trash. Normal farming operations excluded. [Ord. 2004-1]

Section 1204. Unlicensed Vehicles. Vehicles not in use and without current license may not be kept in any uncovered area other than a designated junk, salvage yard, or designated collection site. EXCEPTION: Antique cars being refurbished shall not be required to be kept in a covered area or in above designated areas. [Ord. 2004-1]

Section 1205. Moved in Buildings.

1. Any building, except those in the "A" Agricultural District, moved into any use district must secure a special permit from the County Zoning Officer.

2. Any residence moved into any use district must have signature by petition of one hundred percent (100%) of the adjoining landowners and one hundred percent (100%) of the landowners within two hundred (200) feet. EXCEPTION: A new residence to be used for first occupancy, constructed off the property and moved to location shall not require adjoining landowners' approval. [Ord. 2004-1]

Section 1206. Minimum Water and Sewer Requirements. A water and sewer system cannot be approved until it meets the following standards:

1. All public utilities and facilities shall be located, elevated, and constructed to minimize or eliminate flood damage; and

2. All new or replacement water supply systems and sanitary sewage systems, in addition to meeting the requirements of the South Dakota Department of Water and Natural Resources, must be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters. [Ord. 2004-1]

Section 1207. (Reserved). [Ord. 2004-1]

Section 1208. Shelterbelt Setback Requirements. A shelterbelt, consisting of one (1) or more rows shall not be established with the windward row within one hundred sixty (160) feet of a public right-of-way and the non-windward row within fifteen (15) feet of a public right-of-way. In the event the non-windward row of trees is placed within fifteen (15) feet of a public right-of-way, the shelterbelt shall consist of a minimum of ten rows of trees. The windward row of trees shall consist of shrubbery or tree species, as determined by the State Urban Forester, which aid in the containment of snow. Shelterbelts at right angles to roads shall provide a minimum turnaround of fifty (50) feet measured from the road right-of-way. Shelterbelts shall not be established within one hundred fifty (150) feet of adjoining property lines without written permission of adjoining property owners. Trees used for landscaping the area immediately adjacent to farmsteads and residences are exempt from this regulation. [Ord. 2004-1]

Section 1209. Extended Home Occupation. There are significant differences between home occupations on small tracts and agricultural home occupations. The nature of resources available for use, the benefits and disadvantages created by home occupations, and the problems generated necessitate a distinction between home occupations on small tracts and farm home occupations.

1. For the purpose of this section, provided all requirements are met, the following shall be considered extended home occupations:

    a. Welding repair conducted in a safe manner;

    b. Veterinarian's office;

    c. Blacksmith;

    d. Service office;

    e. Others which, in the opinion of the Board of Adjustment would not conflict with adjoining land uses. [Ord. 2004-1]

Section 1210. On – and Off –Site Signs

1. No private sign shall be erected or maintained which:

    a. Creates a hazard due to collapse, fire, collision, decay, or abandonment; or

    b. Creates traffic hazards, by either:

        i. Confusing or distracting motorists; or

        ii. Impairing the driver’s ability to see pedestrians, obstacles or other vehicles, or

        iii. Impairing the driver’s ability to see and interpret any official traffic sign, signal or device; or

        iv. Creates a nuisance to persons using a public right-of-way; or

v. Constitutes a nuisance to occupancy of adjacent and contiguous property by its brightness, size, height, or movement

2. Signs shall be permitted in all zoning districts, subject to the following provisions:

   a. Wall signs may be located anywhere on the wall of a building.

   b. Freestanding signs shall not project over public property.

   c. Freestanding signs shall not be erected adjacent to a corner of two intersecting streets, unless such signs are constructed to not obstruct the view of said intersection.

   d. Each sign – size, lighting, and location - in the County shall at least meet the standards established by the South Dakota Department of Transportation.

   e. Other than utility fixtures or holiday decorations, no signs, awnings, or display shall be suspended, hanged, or placed so that the same shall hang over any part of a street or sidewalk, used for vehicular or pedestrian travel unless a written application for a permit is made to the County Zoning Officer and the said Official grants a permit therefore.

3. The Zoning Officer shall take into consideration factors that would make the proposed structure likely to endanger the property or personal safety of passerby traveling the streets or sidewalks in question, and whether or not such structure complies with National Building Code relating to outdoor advertising.

4. On-Site Signs: Each sign erected as an on-site sign in those districts where permitted shall have a maximum surface area of eighty (80) square feet and shall observe all yard and height requirements of the district in which it is located.

5. Off-Site Signs: Off-site signs erected in those districts where permitted shall conform to the following requirements:

   a. Each sign shall have a maximum surface area of one thousand two hundred (1,200) square feet, and maximum dimensions of thirty (30) feet in height, and forty (40) feet in length.

   b. Each sign shall not be closer than three hundred (300) feet from any street intersection and five hundred (500) feet from another permitted off-site sign on the same side of the street or road.

   c. Signs shall not be located within the street right-of-way. [Ord. 2004-1]

Section 1211. Energy System (Wes) Requirements [Ord. Ord. 2004-1 unless otherwise noted]

Section 1211.01 Applicability

The requirements of these regulations shall apply to all WES facilities except private facilities with a single tower height of less than seventy-five (75) feet and used primarily for on-site consumption of power.

Section 1211.01 Purpose

The purpose of this ordinance is to insure that the placement, construction and modification of a Wind Energy System (WES) facility is consistent with the County's land use policies, to minimize the impact of WES facilities, to establish a fair and efficient process for review and approval of applications, to assure a comprehensive review of environmental impacts of such facilities, and to protect the health, safety and welfare of the County's citizens. [Ord. 2004-1, Rev. 2004-1G]

Section 1211.02 Federal and State Requirements

All WESs shall meet or exceed standards and regulations of the Federal Aviation Administration and South Dakota State Statutes and any other agency of federal or state government with the authority to regulate WESs.

Section 1211.03 General Provisions

1. Mitigation Measures

    a. Site Clearance. The permittees shall disturb or clear the site only to the extent necessary to assure suitable access for construction, safe operation and maintenance of the WES.

    b. Topsoil Protection. The permittees shall implement measures to protect and segregate topsoil from subsoil in cultivated lands unless otherwise negotiated with the affected landowner.

    c. Compaction. The permittees shall implement measures to minimize compaction of all lands during all phases of the project's life and shall confine compaction to as small an area as practicable.

    d. Livestock Protection. The permittees shall take precautions to protect livestock during all phases of the project's life.

    e. Fences. The permittees shall promptly replace or repair all fences and gates removed or damaged during all phases of the project's life unless otherwise negotiated with the affected landowner.

    f. Roads

        i. Public Roads. Prior to commencement of construction, the permittees shall identify all state, county or township "haul roads" that will be used for the WES project and shall notify the state, county or township governing body having jurisdiction over the roads to determine if the haul roads identified are acceptable. The governmental body shall be given adequate time to inspect the haul roads prior to use of these haul roads. Where practical, existing roadways shall be used for all activities associated with the WES. Where practical, all-weather roads shall be used to deliver cement, turbines, towers, assemble nacelles and all other heavy components to and from the turbine sites.

ii. The permittees shall, prior to the use of approved haul roads, make satisfactory arrangements with the appropriate state, county or township governmental body having jurisdiction over approved haul roads for construction of the WES for the maintenance and repair of the haul roads that will be subject to extra wear and tear due to transportation of equipment and WES components. The permittees shall notify the County of such arrangements upon request of the County.

iii. Turbine Access Roads. Construction of turbine access roads shall be minimized. Access roads shall be low profile roads so that farming equipment can cross them and shall be covered with Class 5 gravel or similar material. When access roads are constructed across streams and drainageways, the access roads shall be designed in a manner so runoff from the upper portions of the watershed can readily flow to the lower portion of the watershed.

iv. Private Roads. The permittees shall promptly repair private roads or lanes damaged when moving equipment or when obtaining access to the site, unless otherwise negotiated with the affected landowner.

v. Control of Dust. The permittees shall utilize all reasonable measures and practices of construction to control dust.

g. Soil Erosion and Sediment Control Plan. The permittees shall develop a Soil Erosion and Sediment Control Plan prior to construction and submit the plan to the County. The Soil Erosion and Sediment Control Plan shall address the erosion control measures for each project phase, and shall at a minimum identify plans for grading, construction and drainage of roads and turbine pads; necessary soil information; detailed design features to maintain downstream water quality; a comprehensive revegetation plan to maintain and ensure adequate erosion control and slope stability and to restore the site after temporary project activities; and measures to minimize the area of surface disturbance. Other practices shall include containing excavated material, protecting exposed soil, stabilizing restored material and removal of silt fences or barriers when the area is stabilized. The plan shall identify methods for disposal or storage of excavated material. [Ord. 2004-1, Rev. 2004-1G]

2. Setbacks [Ord. 2004-1, Rev. 2004-1G]

Wind turbines shall meet the following minimum spacing requirements.

a. Distance from existing off-site residences, business, churches, and buildings owned and/or maintained by a governmental entity and public buildings shall be one thousand (1,000) feet. Distance from on-site or lessor's residence shall be five hundred (500) feet. Distance to be measured from the wall line of the neighboring principal building to the base of the WES tower.

b. Distance from centerline of public right-of-way shall be at least five hundred (500) feet or one hundred ten percent (110%) the height of the wind turbines, whichever distance is greater, two (2) times the height of the wind turbines, measured from the ground surface to the tip of the blade when in a fully vertical position.

c. Distance from any property line shall be at least five hundred (500) feet or one hundred ten percent (110%) the height of the wind turbine, whichever distance is greater, two (2) times the height of the wind turbine, measured from the ground surface to the tip of the blade when in a fully vertical position unless wind easement has been obtained from adjoining property owner.

d. Exception: The Board of Adjustment may allow setback/separation distances to be less than the established distances identified above, if the adjoining landowners agree to a lesser setback/separation distance. If approved, such agreement is to be recorded and filed with the Register of Deeds.

3. Electromagnetic Interference. The permittees shall not operate the WES so as to cause microwave, television, radio, or navigation interference contrary to Federal Communications Commission (FCC) regulations or other law. In the event such interference is caused by the WES or its operation, the permittees shall take the measures necessary to correct the problem.

4. Lighting. Towers shall be marked as required by the Federal Aviation Administration (FAA). There shall be no lights on the towers other than what is required by the FAA. This restriction shall not apply to infrared heating devices used to protect the monitoring equipment. Upon commencement of construction of a Tower, in cases where there are residential uses located within a distance which is three hundred (300) percent of the height of the Tower from the Tower and when required by federal law, dual mode lighting shall be requested from the FAA. Beacon lighting, unless required by FAA, shall not be utilized.

5. Turbine Spacing. The turbines shall be spaced no closer than three (3) rotor diameters (RD) within a string and 10 RDs between strings. If required during final micro siting of the turbines to account for topographic conditions, up to 10 percent of the towers may be sited closer than the above spacing but the permittees shall minimize the need to site the turbines closer.

6. Footprint Minimization. The permittees shall design and construct the WES so as to minimize the amount of land that is impacted by the WES. Associated facilities in the vicinity of turbines such as electrical/electronic boxes, transformers and monitoring systems shall to the greatest extent feasible be mounted on the foundations used for turbine towers or inside the towers unless otherwise negotiated with the affected landowner.

7. Collector Electrical Cables. Collector lines are the conductors of electric energy from the Wind Energy System to the feeder lines. When located on private property,The permittees shall place electrical lines, known as collectors, and communication cables underground between the WES and the feeder lines when located on private property. The exception to this requirement is when the total distance of collectors from the substation requires an overhead installation due to line loss of current from an underground installation. Collectors and cables shall also be placed within or immediately adjacent to the land necessary for turbine access roads unless otherwise negotiated with the affected landowner. This paragraph does not apply to feeder lines. [Ord. 2004-1, Rev. 2004-1G]

8. Feeder Lines. Feeder lines are the conductors of electric energy from the collector lines to the main electric terminal. The permittees shall place overhead electric lines, known as feeders, on public rights-of-way or private property if a public right-of-way exists. Changes in routes may be made as long as feeders remain on pubic rights-of-way and approval has been obtained from the governmental unit responsible for the affected right-of-way. If no public right-of-way exists, the permittees may place feeders on private property. When placing feeders on private property, the permittees shall place the

feeder in accordance with the easement negotiated with the affected landowner. The permittees shall submit the site plan and engineering drawings for the feeder lines before commencing construction. Feeder line support structures (power poles) shall be placed on private property where concrete or other similar materials are used as an exposed or above-ground permanent foundation. [Ord. 2004-1, Rev. 2004-1G]

9. Decommissioning/Restoration/Abandonment

   a. Cost Responsibility. The owner or operator of a WES is responsible for decommissioning that facility and for all costs associated with decommissioning that facility and associated facilities. [Ord. 2004-1, Rev. 2004-1G]

   b. Decommissioning Plan. Within 120 days of completion of construction, the permittees shall submit to the County a decommissioning plan describing the manner in which the permittees anticipate decommissioning the project in accordance with the requirements of paragraph (b) below. The plan shall include a description of the manner in which the permittees will ensure that it has the financial capability to carry out these restoration requirements when they go into effect. The permittees shall ensure that it carries out its obligation to provide for the resources necessary to fulfill these requirements. The County may at any time request the permittees to file a report with the County describing how the permittees are fulfilling this obligation. [Ord. 2004-1]

   c. Financial Assurance. After the tenth (10^{th}) year of operation of a WES facility, the Board may require a performance bond, surety bond, letter of credit, corporate guarantee or other form of financial assurance that is acceptable to the Board to cover the anticipated costs of decommissioning the WES facility. [Ord. 2004-1G]

   d. Site Restoration. The decommissioning of the WES shall begin within eight (8) months of the expiration of this permit, or earlier termination of operation of the WES and be completed within eighteen (18) months of the expiration of this permit or earlier termination of operation of the WES. Upon expiration of this permit, or upon earlier termination of operation of the WES, the permittees shall have the obligation to dismantle and remove from the site all towers, turbine generators, transformers, overhead and underground cables, foundations, buildings and ancillary equipment to a depth of four feet. To the extent possible the permittees shall restore and reclaim the site to its pre-project topography and topsoil quality. All access roads shall be removed unless written approval is given by the affected landowner requesting that one or more roads, or portions thereof, be retained. Any agreement for removal to a lesser depth or for no removal shall be recorded with the County and shall show the locations of all such foundations. All such agreements between the permittees and the affected landowner shall be submitted to the County prior to completion of restoration activities. The site shall be restored in accordance with the requirements of this condition within eighteen months after expiration. [Ord. 2004-1, Rev. 2004-1G]

   e. Failure to Decommission. If the WES facility owner or operator does not complete decommissioning, the Board may take such action as may be necessary to complete decommissioning, including requiring forfeiture of the bond. The entry into a participating landowner agreement shall constitute agreement and consent of the parties to the agreement, their respective heirs, successors, and assigns, that the Board may take such action as may be necessary to decommission a WES facility. [Ord. 2004-1G]

10. Abandoned Turbines. The permittees shall advise the County of any turbines that are abandoned prior to termination of operation of the WES. The County may require the permittees to decommission any abandoned turbine.

11. Height from Ground Surface. The minimum height of blade tips, measured from ground surface when a blade is in fully vertical position, shall be twenty-five (25) feet.

12. Towers.

    a. Color and Finish. The finish of the exterior surface shall be non-reflective and non-glass.

    b. All towers shall be singular tubular design

13. Noise. Noise level shall not exceed 50 dBA, including constructive interference effects at the perimeter of the principal and accessory structures of existing off-site residences, businesses, and buildings owned and/or maintained by a governmental entity property line of existing off-site residences, businesses, and public buildings. [Ord. 2004-1, Rev. 2004-1G]

13. Permit Expiration. The permit shall become void if no substantial construction has been completed within two (2) years of issuance.

14. Required Information for Permit. [Ord. 2004-1, Rev. 2004-1G]

    a. Boundaries of the site proposed for WES and associated facilities on United States Geological Survey Map or other map as appropriate.

    b. Map of easements for WES.

    c. Copy of easement agreements with landowners. Affidavit attesting that necessary easement agreements with landowners have been obtained.

    d. Map of occupied residential structures, businesses churches and buildings owned and/or maintained by a governmental entity and public buildings.

    e. Map of sites for WES, access roads and utility lines. Preliminary map of sites for WES, access roads and collector and feeder lines. Final map of sites for WES, access roads and utility lines to be submitted sixty (60) days prior to construction.

    f. Proof of utility right-of-way easement for access to transmission lines and/or utility interconnection.

    g. Location of other WES in general area.

    h. Project schedule specific environmental concerns (e.g. native habitat, rare species, and migratory routes). This information shall be obtained by consulting with state and federal wildlife agencies. Evidence of such consultation shall be included in the application.

    i. Final haul road agreements to be submitted sixty (60) days prior to construction.

Section 1212. Wireless Telecommunications Towers and Facilities. [Ord. 2004-1]

Section 1212.01. Purpose.

The general purpose of this Section is to regulate the placement, construction, and modification of Towers and Telecommunications Facilities in order to protect the health, safety, and welfare of the public, while at the same time not unreasonably interfering with the development of the competitive wireless telecommunications marketplace in the County.

Specifically, the purposes of this Ordinance are:

1. To regulate the location of Towers and Telecommunications Facilities in the County;

2. To protect residential areas and land uses from potential adverse impact of Towers and Telecommunications Facilities;

3. To minimize adverse visual impact of Towers and Telecommunications Facilities through careful design, siting, landscaping, and innovative camouflaging techniques;

4. To promote and encourage shared use/co-location of Towers and Antenna Support Structures as a primary option rather than construction of additional single-use Towers;

5. To promote and encourage utilization of technological designs that will either eliminate or reduce the need for erection of new Tower structures to support antenna and Telecommunications Facilities;

6. To avoid potential damage to property caused by Towers and Telecommunications Facilities by ensuring such structures are soundly and carefully designed, constructed, modified, maintained, and removed when no longer used or are determined to be structurally unsound; and

7. To ensure that Towers and Telecommunications Facilities are compatible with surrounding land uses.

Section 1212.02. Definitions.

The following words, terms, and phrases, when used in this Section, shall have the meanings ascribed to them in this Section, except where the context clearly indicates a different meaning:

1. **Antenna Support Structure** means any building or structure other than a Tower which can be used for location of Telecommunications Facilities.

2. **Applicant** means any Person that applies for a Tower development permit.

3. **Application** means the process by which the Owner of a parcel of land within the County submits a request to develop, construct, build, modify, or erect a Tower upon such parcel of land. Application includes all written documentation, verbal statements, and representations, in whatever form or forum, made by an Applicant to the County concerning such a request.

4. **Engineer** means any engineer licensed by the State of South Dakota.

5. **Owner** means any Person with fee title or a long-term (exceeding ten (10) years) leasehold to any parcel of land within the County who desires to develop, or construct, build, modify, or erect a Tower upon such parcel of land.

6. **Person** is any natural person, firm, partnership, association, corporation, company, or other legal entity, private or public, whether for profit or not for profit.

7. **Stealth** means any Tower or Telecommunications Facility which is designed to enhance compatibility with adjacent land uses, including, but not limited to, architecturally screened roof-mounted antennas, antennas integrated into architectural elements, and Towers designed to look other than like a Tower such as light poles, power poles, and trees. The term Stealth does not necessarily exclude the use of uncamouflaged lattice, guyed, or monopole Tower designs.

8. **Telecommunications Facilities** means any cables, wires, lines, wave guides, antennas, and any other equipment or facilities associated with the transmission or reception of communications which a Person seeks to locate or has installed upon or near a Tower or Antenna Support Structure. However, Telecommunications Facilities shall not include:

    a. Any satellite earth station antenna two (2) meters in diameter or less which is located in an area zoned industrial or commercial; or

    b. Any satellite earth station antenna one (1) meter or less in diameter, regardless of zoning category.

9. **Tower** means a self-supporting lattice, guyed, or monopole structure constructed from grade which supports Telecommunications Facilities. The term Tower shall not include amateur radio operators' equipment, as licensed by the FCC.

Section 1212.03 Development Of Towers

1. Towers are exempt from the maximum height restrictions of the districts where located. Towers shall be permitted to a height of one hundred and fifty (150) feet. Towers may be permitted in excess of one hundred and fifty (150) feet in accordance with "Criteria for Site Plan Development Modifications."

2. No new Tower shall be built, constructed, or erected in the County unless the Tower is capable of supporting three other Persons' operating Tele-communications Facilities comparable in weight, size, and surface area to the Telecommunications Facilities installed by the Applicant on the Tower within six (6) months of the completion of the Tower construction. No tower shall charge co-location fees in excess of commercially reasonable industry amounts. Each tower constructed shall upon the request of Grant County mount law-enforcement or public safety communications apparatus.

3. An Application to develop a Tower shall include:

    a. The name, address, and telephone number of the Owner and lessee of the parcel of land upon which the Tower is situated. If the Applicant is not the Owner of the parcel of land upon which the Tower is situated, the written consent of the Owner shall be evidenced in the Application.

    b. The legal description, folio number, and address of the parcel of land upon which the Tower is situated.

c. The names, addresses, and telephone numbers of all owners of other Towers or usable Antenna Support Structures within a one-half (½) mile radius of the proposed new Tower site, including County-owned property.

d. A description of the design plan proposed by the Applicant. Applicant must identify its utilization of the most recent technological design, including microcell design, as part of the design plan. The Applicant must demonstrate the need for Towers and why design alternatives, such as the use of microcell, cannot be utilized to accomplish the provision of the Applicant's telecommunications services.

e. An affidavit attesting to the fact that the Applicant made diligent, but unsuccessful, efforts to install or co-locate the Applicant's Telecommunications Facilities on Towers or usable Antenna Support Structures owned by other Persons located within a one-half (½) mile radius of the proposed Tower site. In the event that one reason for the unsuccessful efforts to install or co-locate is that fees to be charged are not commercially reasonable, an explanation shall be provided why said charges are commercially unreasonable.

f. Written technical evidence from an Engineer(s) that the proposed Tower or Telecommunications Facilities cannot be installed or co-located on another person's Tower or usable Antenna Support Structures owned by other Persons located within one-half (½) mile radius of the proposed Tower site.

g. A written statement from an Engineer(s) that the construction and placement of the Tower will not interfere with public safety communications and the usual and customary transmission or reception of radio, television, or other communications services enjoyed by adjacent residential and non-residential properties.

h. Written, technical evidence from an Engineer(s) that the proposed structure meets the standards set forth in, "Structural Requirements," of this Ordinance.

i. Written, technical evidence from a qualified Engineer(s) acceptable to the Fire Marshall and the building official that the proposed site of the Tower or Telecommunications Facilities does not pose a risk of explosion, fire, or other danger to life or property due to its proximity to volatile, flammable, explosive, or hazardous materials such as LP gas, propane, gasoline, natural gas, or corrosive or other dangerous chemicals.

j. The FCC has sole jurisdiction of the field of regulation of RF emissions and does not allow the County to condition or deny on the basis of RF impacts the approval of any Telecommunications Facilities (whether mounted on Towers or Antenna Support Structures) which meet FCC standards. In order to provide information to its citizens, the County shall make available upon request copies of ongoing FCC information and RF emission standards for Telecommunications Facilities transmitting from Towers or Antenna Support Structures. Applicants shall be required to submit information on the proposed power density of their proposed Telecommunications Facilities and demonstrate how this meets FCC standards.

k. No application shall be accepted from landowners or on property on which there are current or past unresolved violations outstanding.

4. The Board of Adjustment may require an Applicant to supplement any information that the Board considers inadequate or that the Applicant has failed to supply. The Board of Adjustment may deny an Application on the basis that the Applicant has not satisfactorily supplied the information required in this subsection. Applications shall be reviewed by the Board in a prompt manner and all decisions shall be supported in writing setting forth the reasons for approval or denial.

Section 1212.04 Setbacks

1. All Towers up to one-hundred (100) feet in height shall be set back on all sides a distance equal to the underlying setback requirement in the applicable zoning district.

2. Towers in excess of one hundred (100) feet in height shall meet the following:

    a. Distance from existing off-site residences, business and public buildings shall be one thousand (1,000) feet. Distance from on-site or lessor's residence shall be five hundred (500) feet.

    b. Distance from public right-of-way shall be the height of the tower.

    c. Distance from any property line shall be the height of the tower.

3. Setback requirements for Towers shall be measured from the base of the Tower to the property line of the parcel of land on which it is located.

4. Setback requirements may be modified, as provided in, when placement of a Tower in a location which will reduce the visual impact can be accomplished. For example, adjacent to trees which may visually hide the Tower.

Section 1212.05 Structural Requirements

All Towers must be designed and certified by an Engineer to be structurally sound and, at minimum, in conformance with the Building Code, and any other standards outlined in this Ordinance. All Towers in operation shall be fixed to land.

Section 1212.06 Separation or Buffer Requirements

For the purpose of this Section, the separation distances between Towers shall be measured by drawing or following a straight line between the base of the existing or approved structure and the proposed base, pursuant to a site plan of the proposed Tower.

Proposed Towers must meet the following minimum separation requirements from existing towers or towers which have a development permit but are not yet constructed at the time a development permit is granted pursuant to this Ordinance:

1. Monopole Tower structures shall be separated from all other Towers, whether monopole, self-supporting lattice, or guyed, by a minimum of seven hundred and fifty (750) feet.

2. Self-supporting lattice or guyed Tower structures shall be separated from all other self-supporting or guyed Towers by a minimum of fifteen hundred (1,500) feet.

3. Self-supporting lattice or guyed Tower structures shall be separated from all monopole Towers by a minimum of seven hundred and fifty (750) feet.

Section 1212.07 Method of Determining Tower Height

Measurement of Tower height for the purpose of determining compliance with all requirements of this Section shall include the Tower structure itself, the base pad, and any other Telecommunications Facilities attached thereto which extend more than twenty (20) feet over the top of the Tower structure itself. Tower height shall be measured from grade.

Section 1212.08 Illumination

Towers shall not be artificially lighted except as required by the Federal Aviation Administration (FAA). Upon commencement of construction of a Tower, in cases where there are residential uses located within a distance which is three hundred (300) percent of the height of the Tower from the Tower and when required by federal law, dual mode lighting shall be requested from the FAA. Beacon lighting, unless required by FAA, shall not be utilized.

Section 1212.09 Exterior Finish

Towers not requiring FAA painting or marking shall have an exterior finish which enhances compatibility with adjacent land uses, as approved by the appropriate reviewing body.

Section 1212.10 Modification Of Towers

1. A Tower existing prior to the effective date of this Ordinance, which was in compliance with the County's zoning regulations immediately prior to the effective date of this Ordinance, may continue in existence as a nonconforming structure. Such non-conforming structures may be modified or demolished and rebuilt without complying with any of the additional requirements of this Section, except for Sections "Separation or Buffer Requirements", "Certification and Inspections", and "Maintenance," provided:

    a. The Tower is being modified or demolished and rebuilt for the sole purpose of accommodating, within six (6) months of the completion of the modification or rebuild, additional Telecommunications Facilities comparable in weight, size, and surface area to the discrete operating Telecommunications Facilities of any Person currently installed on the Tower.

    b. An Application for a development permit is made to the Board of Adjustment which shall have the authority to issue a development permit without further approval. The grant of a development permit pursuant to this Section allowing the modification or demolition and rebuild of an existing nonconforming Tower shall not be considered a determination that the modified or demolished and rebuilt Tower is conforming.

    c. The height of the modified or rebuilt Tower and Telecommunications Facilities attached thereto do not exceed the maximum height allowed under this Ordinance.

Section 1212.11 Certifications And Inspections

1. All Towers shall be certified by an Engineer to be structurally sound and in conformance with the requirements of this ordinance and all other construction standards set forth by federal and state law. For new monopole Towers, such certification shall be submitted with an Application pursuant to of this Ordinance and every five (5) years thereafter. For new lattice or guyed Towers, such certification shall be submitted with an Application pursuant to this Ordinance and every two (2) years thereafter. The Tower owner may be required by the County to submit more frequent certifications should there be reason to believe that the structural and electrical integrity of the Tower is jeopardized.

2. The County or its agents shall have authority to enter onto the property upon which a Tower is located, between the inspections and certifications required above, to inspect the Tower for the purpose of determining whether it complies with this ordinance and all other construction standards provided by federal and state law.

3. The County reserves the right to conduct such inspections at any time, upon reasonable notice to the Tower owner. All expenses related to such inspections by the County shall be borne by the Tower owner.

Section 1212.12 Maintenance

1. Tower owners shall at all times employ ordinary and reasonable care and shall install and maintain in use nothing less than commonly accepted methods and devices for preventing failures and accidents which are likely to cause damage, injuries, or nuisances to the public.

2. Tower owners shall install and maintain Towers, Telecommunications Facilities, wires, cables, fixtures, and other equipment in substantial compliance with the requirements of the National Electric Safety Code and all FCC, state, and local regulations, and in such manner that will not interfere with the use of other property.

3. All Towers, Telecommunications Facilities, and Antenna Support Structures shall at all times be kept and maintained in good condition, order, and repair so that the same shall not menace or endanger the life or property of any Person.

4. The property in which Towers, Telecommunications Facilities, and Antenna Support Structures are situated shall be maintained in a manner to control noxious weeds.

5. All maintenance or construction of Towers, Telecommunications Facilities, or Antenna Support Structures shall be performed by licensed maintenance and construction personnel.

6. All Towers shall maintain compliance with current RF emission standards of the FCC.

7. In the event that the use of a Tower is discontinued by the Tower owner, the Tower owner shall provide written notice to the County of its intent to discontinue use and the date when the use shall be discontinued.

Section 1212.13 Criteria for Site Plan Development Modifications

1. Notwithstanding the Tower requirements provided in this Ordinance, a modification to the requirements may be approved by the Board of Adjustment as a conditional use in accordance with the following:

    a. In addition to the requirement for a Tower Application, the Application for modification shall include the following:

        i. A description of how the plan addresses any adverse impact that might occur as a result of approving the modification.

        ii. A description of off-site or on-site factors which mitigate any adverse impacts which might occur as a result of the modification.

        iii. A technical study that documents and supports the criteria submitted by the Applicant upon which the request for modification is based. The technical study shall be certified by an Engineer and shall document the existence of the facts related to the proposed modifications and its relationship to surrounding rights-of-way and properties.

        iv. For a modification of the setback requirement, the Application shall identify all parcels of land where the proposed Tower could be located, attempts by the Applicant to contract and negotiate an agreement for co-location, and the result of such attempts.

        v. The Board of Adjustment may require the Application to be reviewed by an independent Engineer under contract to the County to determine whether the antenna study supports the basis for the modification requested. The cost of review by the County's Engineer shall be reimbursed to the County by the Applicant.

2. The Board of Adjustment shall consider the Application for modification based on the following criteria:

    a. That the Tower as modified will be compatible with and not adversely impact the character and integrity of surrounding properties.

    b. Off-site or on-site conditions exist which mitigate the adverse impacts, if any, created by the modification.

    c. In addition, the board may include conditions on the site where the Tower is to be located if such conditions are necessary to preserve the character and integrity of the neighborhoods affected by the proposed Tower and mitigate any adverse impacts which arise in connection with the approval of the modification.

3. In addition to the requirements of subparagraph (2) of this Section, in the following cases, the Applicant must also demonstrate, with written evidence, the following:

    a. In the case of a requested modification to the setback requirement, that the setback requirement cannot be met on the parcel of land upon which the Tower is proposed to be located and the alternative for the Person is to locate the Tower at another site which is closer in proximity to a residentially zoned land.

b. In the case of a request for modification of the separation and buffer requirements from residential use of land of, if the Person provides written technical evidence from an Engineer(s) that the proposed Tower and Telecommunications Facilities must be located at the proposed site in order to meet the coverage requirements of the Applicant's wireless communications system and if the Person is willing to create approved landscaping and other buffers to screen the Tower from being visible to residentially used property.

c. In the case of a request for modification of the height limit for Towers and Telecommunications Facilities or to the minimum height requirements for Antenna Support Structures, that the modification is necessary to:

   i. Facilitate co-location of Telecommunications Facilities in order to avoid construction of a new Tower; or

   ii. To meet the coverage requirements of the Applicant's wireless communications system, which requirements must be documented with written, technical evidence from an Engineer(s) that demonstrates that the height of the proposed Tower is the minimum height required to function satisfactorily, and no Tower that is taller than such minimum height shall be approved.

Section 1212.14 Abandonment

1. If any Tower shall cease to be used for a period of 365 consecutive days, the Planning and Zoning Commission shall notify the Owner, with a copy to the Applicant, that the site will be subject to a determination by the Planning and Zoning Commission that such site has been abandoned. The Owner shall have thirty (30) days from receipt of said notice to show, by a preponderance of the evidence that the Tower has been in use or under repair during the period. If the Owner fails to show that the Tower has been in use or under repair during the period, the Planning and Zoning Commission shall issue a final determination of abandonment for the site. Upon issuance of the final determination of abandonment, the Owner shall, within seventy-five (75) days, dismantle and remove the Tower.

2. To secure the obligation set forth in this Section, the Applicant [and/or Owner] may be required to post a bond.

Section 1213. PRIVATE WIND ENERGY CONVERSION SYSTEMS (PWECS). [Ord. 2004-1G]

The regulations regarding Private Wind Energy Conversion Systems (hereafter referred to as PWECS) shall be as follows:

1. Limited Use. No PWECS installed in accordance with the requirements of these regulations shall generate power as a commercial enterprise as defined by the Public Utility Commission.

2. Setback Requirements. The minimum setback distance between each wind turbine tower and all surrounding property lines, overhead utility or transmission lines, other wind turbine towers, electrical substations, public roads and dwellings shall be equal to no less than one hundred ten percent (110%) the system height, unless written permission is granted by the affected entity.

3. Contiguous property owners and planned developments may construct a PWECS for their use in common. If property held by more than one (1) single owner is used to meet the setback requirements, a site plan establishing easements or reserved areas must be submitted to the Board of Adjustment for their approval.

4. Tower Access. Climbing access to the PWECS tower shall be limited either by means of a fence six (6) feet high around the tower base with a locking portal, or by limiting tower climbing apparatus so there is access to it no lower than twelve (12) feet from the ground.

5. Electromagnetic Interference. If a PWECS is installed in any location along or within the major access of an existing microwave communications link, the person desiring to install the PWECS shall be required to provide a letter from the business whose link they are within or adjacent to stating that the business whose link is affected would have no objection to the installation of the PWECS.

6. Air Space. A PWECS shall be located or installed in compliance with the guidelines of the Federal Aviation Administration Regulations with regard to Airport Approach Zones and clearance around VOR stations.

7. Interconnect. The PWECS, if interconnected to an electric utility distribution system, shall meet the interconnect requirements of the electric utility company.

Section 1214. Day Care Center [Ord. 2004-1K]

The regulations regarding Day Care facilities, in addition to requiring a conditional use permit in a commercial zone, shall meet the following conditions:

1. Obtain and maintain a certificate of licensure of Day Care facility by meeting all requirements set forth by the State of South Dakota.

2. Provide a fence around the perimeter of the area to be occupied by children. Height, size and materials of the fence shall be as approved by the Board of Adjustment. Additional screening may be required.

3. Day care centers shall have access from County or State Highways and provide safe and adequate loading and parking on site.

Chapter 1215. Agribusiness Activities: [Ord. 2016-01B]

Section 1215.01. Intent

Agribusiness activities include identified commercial activities involving the handling, storage, processing and shipping of farm products. Agribusiness activities are operated as a principle use on a property, and are not operated accessory to residential uses. The following commercial activities may be considered agribusiness activities if operated in accordance with the requirements contained in Section 1215.02:

1. Custom fertilizer/herbicide application;

2. Custom planting;

3. Custom harvesting;

4. Grain storage;

5. Processing of products agriculturally-related raw products raised, grown or purchased by the landowner or operator.

Section 1215.02. Requirements

1. Agribusiness activities must have access to a concrete or bituminous asphalt, or county maintained gravel street or upon written approval of the Township authority for a Township road.

2. Operators of agribusiness activities shall enter into and comply with a haul road agreement for the applicable streets if deemed necessary by the applicable road authority for the maintenance of identified haul routes attendant to the operation of the proposed business.

3. Lighting on the site shall be limited to downward directed lights or other lighting customarily used for agricultural operations.

4. The number, size, and illumination standards for signs shall be determined by the Board of Adjustment.

5. No equipment or process shall be used which creates noise, vibration, glare, fumes, odors, or electrical interference detectable to the normal senses off the lot. In the case of electrical interference, no equipment or process shall be used which creates visual or audible interference in any radio or television receivers off the premises, or causes fluctuations in line voltage off the premises.

6. All vehicles and equipment stored outside shall be operable.

7. Permits for Agribusiness activities are specific to a single use listed in Section 1215.01. An agribusiness activity may only be changed to another agribusiness activity if specifically authorized by the Board of Adjustment.

8. Permits for Agribusiness activities may be transferred, unless otherwise stated by the Board of Adjustment.

Section 1215.03. Applications

1. In addition to the following information, plans shall be drawn to scale and shall be of sufficient clarity to indicate the location, nature, and extent of the work proposed and show in detail that it will conform to the provisions of this chapter and all other relevant laws, ordinances, rules and regulations. The Zoning Officer may waive the submission of plans if the nature of the work applied for is such that reviewing of plans is not necessary to obtain compliance with this chapter. The site plan shall contain the following:
    a. The address of the property and the legal description.
    b. The name of the project and/or business.
    c. The scale and north arrow.
    d. All existing and proposed buildings or additions.
    e. Dimensions of all buildings.
    f. Distance from all building lines to the property lines at the closest points.

g. Dimensions of all property lines.

h. Maximum number of employees expected to be employed at the site.

i. Hours of operation. (If it is expected that hours of operation will vary depending upon the season, the applicant should state minimum and maximum hours of operation and when those minimum and maximum hours are expected.)

j. Number and type of vehicles expected to use the site each day. (If it is expected that traffic will vary depending upon the season, the applicant should state minimum and maximum number of vehicles expected and when those minimum and maximum numbers are expected.)

k. Parking lots or spaces; designate each space, give dimensions of the lot, stalls and aisles (if applicable).

l. The landscaped setback and trees; indicate species of trees and material to be used for landscaping.

m. Name and location of all adjacent streets, alleys, waterways and other public places.

n. Names and locations of proposed haul roads.

o. Proposed grading and drainage pattern.

p. Proposed interior circulation pattern indicating the status of street ownership.

q. Phasing plan for development (if more than one phase is planned).

2. Approved plans shall not be changed, modified, or altered without authorization from the Board of Adjustment giving final approval, and all work shall be done in accordance with the approved plans. [Ord.2016-01B]

ARTICLE XIII
CONCENTRATED ANIMAL FEEDING OPERATION REGULATIONS

Section 1300. Intent.

A supply of healthy livestock, poultry and other animals is essential to the well-being of county citizens and the State of South Dakota. However, livestock, poultry, and other animals produce manure which may, where improperly stored, transported, or disposed, negatively affect the County's environment. Confined Animal Feeding Operations, also referred to herein as CAFO(s), and the manure generated from those facilities must be controlled where it may add to air, surface water, ground water, or land pollution. The following regulations have been adopted in order to provide standards for the location of animal feeding operations and to provide protection against pollution caused by manure from domesticated animals. All Animal Feeding Operations shall comply with the regulations as outlined herein. [Ord. 2004-1, Rev. 2016-01]

Section 1301. Animal Units Equivalent to Animal Species

Grant County uses an animal unit equivalency ratio to determine the head count of a specific animal species for the purpose of defining the specific class of a CAFO by animal unit. The animal species equivalents are based upon a species' manure production. The standards for determining an animal unit to animal head count equivalency are derived from the Environmental Protection Agency and the State of South Dakota General Permit. Table 1301.1 details the classes of Concentrated Animal Feeding Operations and the specific animal unit equivalency ratio. Note that the figures in Table 1301.1 relate to inventory rather than annual production. [Ord. 2004-1, Rev. 2016-01]

Table 1301.1
Number of Animals to Define Classes of Concentrated Animal Feeding Operations
[Ord. 2004-1, Rev. 2016-01]

Animal Species	Class A CAFO (Over 5000 Animal Units)	Class B CAFO (2,000-4,999 Animal Units)	Class C CAFO (1,000-1,999 Animal Units)	Class D CAFO (50 to 999 Units – Water Pollution Hazard)	Class E CAFO (50 to 999 Units – No Water Pollution Hazard)	Animal Unit Equivalency Ratio
	Animal numbers equal to or more than:	Animal numbers equal to:	Animal numbers equal to:	Animal numbers equal to:	Animal numbers equal to:	
Cattle other than mature dairy cows or veal calves [1]	5,000	2,000 to 4,999	1,000 to 1,999	50 to 999	50 to 999	1.0
Mature Dairy Cattle (milked or dry)	3,497	1,400 to 3,496	700 to 1,399	35 to 699	35 to 699	1.43
Swine (weighing over 55 lbs)	12,500	5,000 to 12,499	2,500 to 4,999	125 to 2,499	125 to 2,499	0.4
Swine (weighing less than 55 lbs)	50,000	20,000 to 49,999	10,000 to 19,999	500 to 9,999	500 to 9,999	0.1
Horses	2,500	1,000 to 2,499	500 to 999	25 to 499	25 to 499	2.0
Sheep or lambs	50,000	20,000 to 49,999	10,000 to 19,999	500 to 9,999	500 to 9,999	0.1
Turkeys	277,778	110,000 to 277,777	55,000 to 109,999	2,775 to 54,999	2,775 to 54,999	0.018
Chickens, other than laying hens using other than liquid manure handling system	625,000	250,000 to 624,999	125,000 to 249,999	6,250 to 124,999	6,250 to 124,999	.008
Laying hens using other than liquid manure handling system	409,836	164,000 to 409,835	82,000 to 163,999	4,165 to 81,999	4,165 to 81,999	.0122
Laying Hens & Broilers using liquid manure handling system	150,150	60,000 to 150,149	30,000 to 59,999	1,500 to 29,999	1,500 to 29,999	.0333
Ducks Using liquid manure Handling system	25,000	10,000 to 24,999	5,000 to 9,999	250 to 4,999	250 to 4,999	0.2
Ducks using other than liquid manure handling system)	151,515	60,000 to 151,514	30,000 to 59,999	515 to 29,999	515 to 29,999	.033
Geese	151,515	60,000 to 151,514	30,000 to 59,999	515 to 29,999	515 to 29,999	.033

1. Cattle includes but is not limited to heifers, steers, bulls and cow/calf pairs.

Section 1302. Classes of Concentrated Animal Feeding Operations. [Ord. 2004-1, Rev. 2016-01]

For the purpose of these regulations, Concentrated Animal Feeding Operations are divided into the following classes:

	ANIMAL UNITS	
Class A	5,000 or more	
Class B	2,000 to 4,999	
Class C	1,000 to 1,999	
Class D	50 to 999	(Potential water pollution hazard)
Class E	50 to 4 999	No pollution hazard)

Section 1303. Concentrated Animal Feeding Operation Permit Requirements [Ord. 2004-1 unless otherwise noted]

Owners of Class A, Class B, Class C, Class D, and Class E Concentrated Animal Feeding Operations are required to complete, where applicable, a building permit, and/or conditional use permit application as follows:

1. A new Concentrated Animal Feeding Operation is proposed where one does not exist. [Ord. 2004-1, Rev. 2016-01]

2. An expansion is proposed that exceeds the number of animal units allowed by an existing county-issued permit. [Ord. 2004-1, Rev. 2016-01]

3. An expansion in the number of animal units of a Concentrated Animal Feeding Operation, without a county-issued permit, that existed prior to (Date of adoption of ordinance), which would result in the creation of either a Class A, B, C, D, or E Concentrated Animal Feeding Operation. [Ord. 2004-1, Rev. 2016-01]

4. In the event there is a change in ownership of a Class A, B, C, D, or E Concentrated Animal Feeding Operation, which has a previously issued county permit, the new owner(s) has sixty (60) days from the date of legal conveyance of ownership in which to apply for a transfer of a previously issued county CAFO permit in order to keep said current permit valid. The new owner will be required to abide by the permit requirements and any letter of assurances that were issued under the previously approved permit application(s). If no transfer is completed within sixty (60) days, the new owner will be required to submit a new application for approval. [Ord. 2004-1, Rev. 2016-01]

5. A change in ownership of any Concentrated Animal Feeding Operation with a history of pollution documented by the County Zoning Officer or State of South Dakota. [Ord. 2004-1, Rev. 2016-01]

6. An existing Concentrated Animal Feeding Operation is to be restocked after being idle for five (5) years.

7. A signed complaint has been received by the County Zoning Officer and/or South Dakota Departmentof Environment and Natural Resources and after inspection reveals that the Concentrated Animal Feeding Operation is in violation of either County or State regulations. Violations of State regulations shall be inspected by State officials. [Ord. 2004-1, Rev. 2016-01]

Section 1304. Concentrated Animal Feeding Operation Control Requirements

1. No Significant Contribution of Pollution

   In general, no Concentrated Animal Feeding Operation shall be constructed, located, or operated so as to create a significant contribution of pollution as determined by the South Dakota Department of Environment and Natural Resources. [Ord. 2004-1, Rev. 2016-01]

2. State General Permit

   a. Class A, Class B, Class C Concentrated Animal Feeding Operations shall obtain a State General Permit pertaining to the animal species of the Concentrated Animal Feeding Operation. A County conditional use permit may be approved conditioned upon receiving a State General Permit. The issuance of a State General Permit satisfies the county's requirements for an approved nutrient management plan and manure management plan. [Ord. 2004-1, Rev. 2016-01]

   b. It shall be at the discretion of the Zoning Officer and/or the Board of Adjustment to require an applicant to submit plans for review to the South Dakota Department of Environment and Natural Resources. A Class D and Class E Concentrated Animal Feeding Operations may be required to submit their plans for review by the South Dakota Department of Environment and Natural Resources if the following occur: [Ord. 2004-1, Rev. 2016-01]

      i. If a lagoon is used as a manure management facility. Exception: Existing operations that are improving waste handling facilities that are designed by an engineer according to South Dakota Department of Environment and Natural Resources General Permit or Natural Resource Conservation Service standards. [Ord. 2004-1, Rev. 2016-01]

      ii. The Zoning Officer and/or the Board of Adjustment decide conditions require a State General Permit. [Ord. 2004-1, Rev. 2016-01]

3. Nutrient Management Plan.

   Nutrient management planning can ensure that the 4 R's (Right rate, Right source, Right application method, and Right application timing) provide the proper amount of nutrients to the crop where it is needed while protecting surface and ground water. The discharge of manure, litter, or process wastewater to waters of the state as a result of land application of that manure, litter, or process wastewater by the Concentrated Animal Feeding Operation to land it owns, rents, or leases is a discharge except where the manure, litter or process wastewater has been applied in accordance with its approved nutrient management plan. The applicant is responsible for the safe land application of manure and process wastewater generated at the Concentrated Animal Feeding Operation. The applicant shall develop, maintain, and follow a nutrient management plan, per the requirements below, to ensure safe disposal of manure and process wastewater and protection of surface and ground water. [Ord. 2004-1, Rev. 2016-01]

   a. Class A, B, C, D and E (with at least 500 animal units) Concentrated Animal Feeding Operations established after June 9, 2016 or an expansion of an existing Concentrated Animal Feeding Operation consistent with Section 1304.7.a. are required to have a nutrient management plan. [Ord. 2004-1, Rev. 2016-01, Rev. 2016-01A]

b. Nutrient management plan(s) for Class A, Class B, and Class C Concentrated Animal Feeding Operations shall be reviewed and approved by the South Dakota Department of Environment & Natural Resources. The issuance of a State General Permit satisfies the county's requirements for an approved nutrient management plan. [Ord. 2016-01,]

c. The nutrient management plan(s) for Class D and E Concentrated Animal Feeding Operations nutrient management plans shall be developed by a Certified Crop Advisor and meet the current Natural Resources Conservation Service (NRCS) South Dakota Technical Nutrient Management Standards and all other applicable South Dakota Department of Environment & Natural Resources and Grant County regulations. [Ord. 2016-01,]

d. The applicant must maintain records to show compliance with the approved nutrient management plan. [Ord. 2016-01,]

e. The applicant must comply with Manure Application Setbacks found in 1304.8. [Ord. 2016-01,]

f. Documentation of land spreading agreements shall be available upon request by the County. [Ord. 2016-01,]

4. Manure Management and Operation Plan

a. Class A, B, C, D, and E (with at least 500 animal units) Concentrated Animal Feeding Operations established after June 9, 2016 or an expansion of an existing Concentrated Animal Feeding Operation consistent with Section 1304.7.a. are required to have a Manure Management and Operation Plan. [Ord. 2004-1, Rev. 2016-01, Rev. 2016-01A]

b. The manure management and operation plan for Class A, Class B and Class C Concentrated Animal Feeding Operations reviewed and approved by the South Dakota Department of Environment & Natural Resources. The issuance of a State General Permit satisfies the county's requirements for an approved manure management plan. [Ord.2016-01]

c. Class D and E Concentrated Animal Feeding Operations manure management and operation plans shall at a minimum meet the current Natural Resources Conservation Service (NRCS) Standards and all applicable DENR and Grant County Zoning Standards. [Ord.2016-01]

d. Manure Management and Operation Plan must include:

1. The location and specifics of proposed manure management facilities. [Ord. 2004-1, Rev. 2016-01]

2. The operation procedures and maintenance of manure management facilities. [Ord. 2004-1, Rev. 2016-01]

3. Plans and specifications must be prepared or approved by a registered professional engineer, or a Natural Resource Conservation Service (NRCS) engineer. Manure management treatment facilities will require inspection by an engineer. [Ord. 2004-1, Rev. 2016-01]

4. Manure shall not be stored longer than two (2) years. [Ord. 2004-1, Rev. 2016-01]

5. Manure management containment structures shall provide for a minimum design volume of three hundred sixty-five (365) days of storage. [Ord. 2004-1, Rev. 2016-01]

6. Manure management facilities utilizing methane digesters may receive on and off-site generated manure and/or organic wastes. [Ord. 2004-1, Rev. 2016-01]

7. If a lagoon is used as a manure management facility for a Class A, B, C, and D CAFO, situated over the shallow aquifer per Section 1105.03, a man-made impervious liner will be used in conjunction with a clay liner. [Ord.2016-01]

8. The applicant will provide information regarding how manure from the CAFO site will be transported to fields identified in the nutrient management plan. This may require the need for a haul road agreement and/or the applicable agreement for pipes to occupy the right-of-way or private property. Unless otherwise agreed to between the Road Authority and the applicant, at Grant County requires, at a minimum, the applicant to abide by the haul road agreement terms found in Grant County Resolution #2014-36[Ord.2016-01]

e. As a condition of the permit, the Zoning Officer and/or the Board of Adjustment may require the applicant to participate in environmental training programs [Ord. 2004-1, Rev. 2016-01]

5. Management Plan for Fly and Odor Control

a. Class A, B, C, D, and E Concentrated Animal Feeding Operations shall dispose of dead animals, manure and wastewater in such a manner as to control odors or flies. A management plan is required for Class A, B, C, D, and E (with at least 500 animal units) Concentrated Animal Feeding Operations established after June 9, 2016 or an expansion of an existing Concentrated Animal Feeding Operation consistent with Section 1304.7.a. The Zoning Officer and/or Board of Adjustment will review the need for control measures on a site-specific basis. The following procedures to control flies and odors shall be considered in a management control plan: [Ord. 2004-1, Rev. 2016-01, Rev. 2016-01A]

i. Operational plans for manure collection, storage treatment and how said plans will be updated and implemented. [Ord. 2004-1, Rev. 2016-01]

ii. Methods to be utilized to dispose of dead animals shall be included [Ord. 2004-1, Rev. 2016-01]

iii. Location of existing and proposed tree/shrub plantings. [Ord. 2004-1, Rev. 2016-01]

b. The County recommends the following Best Management Practices in the development of a fly and odor management plan: [Ord. 2004-1 unless otherwise noted]

i. Provide adequate slope and drainage to remove surface water from pens and keep pen area dry so odor production is minimized.

ii.Store solid manure in containment areas having good drainage to minimize odor production.

iii.Remove manure from open pens as frequently as possible to minimize odor production.

iv. Avoid spreading manure on weekends, holidays and evenings during warm season when neighbors may be involved in outdoor recreation activities.

v. Avoid spreading during calm and humid days, since these conditions restrict the dispersion and dilution of odors.

c. To assist in mitigating odors, the County may require any or all of the following: [Ord. 2016-01]

i . Use of covers on open storage systems for liquid manure systems to reduce odor production. [Ord. 2004-1, Rev. 2016-01]

ii.The storage of solid manure in self-contained containment areas to minimize odor production. [Ord. 2016-01]

iii. The use of bio-filters or other proven odor mitigation technologies on enclosed concentrated animal feeding operation barns/structures to reduce odor production. The design and installation of said bio-filters shall be reviewed by specialists at South Dakota State University or others designated by the Board of Adjustment. [Ord. 2016-01]

6. Required Minimum Setbacks and Separation Distance for Classes A, B, C, D, and E Concentrated Animal Feeding Operations established after June 9, 2016 and those Existing, Concentrated Animal Feeding operations expanding consistent with Section 1304.7.a. See Table 1304.1. [Ord. 2004-1, Rev. 2004-1B, Rev. 2016-01, Rev. 2016-01A]

Table 1304.1
Minimum Setbacks* ^^
[Ord. 2004-1, Rev. 2016-01]

Number of Animal Units	Less than 350 Animal Units	350 to 699 Animal Units	700 to 999 Animal Units	1,000 to 1,999 Animal Units	2,000 to 6,999 Animal Units	Over 7,000 Animal Units
Established Residences	660 feet	1,320 feet	1,980 feet	2,640 feet	3,960 feet	5,280 feet
Churches, Businesses and Commercially Zoned Areas	2,640 feet	2,640 feet	2,640 feet	2,640 feet	3,960 feet	5,280 feet
Incorporated Municipality Limits	2,640 feet	2,640 feet	2,640 feet	2,640 feet	3,960 feet	5,280 feet
Public Schools	2,640 feet	2,640 feet	2,640 feet	2,640 feet	2,640 feet	2,640 feet
Established Private Water Well***	500 feet	500 feet	500 feet	500 feet	500 feet	500 feet
Existing Public Water Well	1,000 feet	1,000 feet	1,000 feet	1,000 feet	1,000 feet	2,640 feet
Lakes and Streams classified as Fisheries as identified by the State	200 feet	200 feet	200 feet	500 feet	500 feet	500 feet
Federal, State & County Road ROW						
Confinement	200 feet	200 feet	200 feet	300 feet	300 feet	300 feet
Open Lot	50 feet	50 feet	50 feet	50 feet	50 feet	50 feet
Township Road ROW						
Confinement	150 feet	150 feet	150 feet	150 feet	150 feet	150 feet
Open Lot	50 feet	50 feet	50 feet	50 feet	50 feet	50 feet

* Two (2) or more CAFOs under common ownership are a single concentrated animal feeding operation if they adjoin each other (within one mile) or if they use a common area or system for disposal of manure. Required setbacks for the two (2) or more CAFOs treated as a single operation shall not be less than the minimum setback required for each operation if said operations were treated as individual operations.

^^ The Board of Adjustment may utilize Section 1304.7 and 1304.8 to increase or decrease the required setback.

*** Setback does not apply to the wells of the CAFO operator. The 500 foot setback will be applied when monitoring wells are utilized and when an impervious liner is used in conjunction with an earthen storage basin or lagoon. In the event monitoring wells and impervious liners are not utilized with the manure management facility the setback from established private wells, not to include the CAFO operator, shall be two thousand six hundred forty (2,640) feet.

7. Exceptions/Exemptions to Separation and/or Setback Distance Requirements

a. Except as identified in 1304.7(e) through (h), below, all Concentrated Animal Feeding Operations vested prior to January 1, 2019 which do not comply with the minimum setback requirements, but continue to operate, and are not expanded in a manner which will result in the one of the following examples are exempt from setback/separation distance requirements:

i. Example 1: A Class E CAFO expands to a Class A or B CAFO.
ii. Example 2: A Class C CAFO expands to a Class A or B CAFO.
iii. Example 3: A Class B CAFO expands to a Class A CAFO.
iv. Example 4: A Class A CAFO expands by 10% of the number of animal units
[Ord. 2004-1, Rev. 2016-01, Rev. 2016-01A]

b. A Concentrated Animal Feeding Operation structure which is expanded or constructed, if the title holder of the land benefiting from the distance separation requirement executes a written waiver with the title holder of the land where the structure is located, under such terms and conditions which the parties may negotiate. The written waiver becomes effective only upon the recording of the waiver in the office of the Register of Deeds in the county. The title holder of the land benefitting from the distance separation requirement is the residence, commercial enterprise, individual or individuals, governmental entity, religious institution, or educational institution from which separation is required. The waiver shall be binding upon the heirs, successors, and assigns of the title holder and shall pass with the land. [Ord. 2004-1, Rev. 2016-01]

c. A Concentrated Animal Feeding Operation structure which is constructed or expanded closer than the required setback/separation distance from the corporate limits of a city, if the incorporated community approves a written waiver. The written waiver becomes effective only after recording with the Register of Deeds. [Ord. 2004-1, Rev. 2016-01]

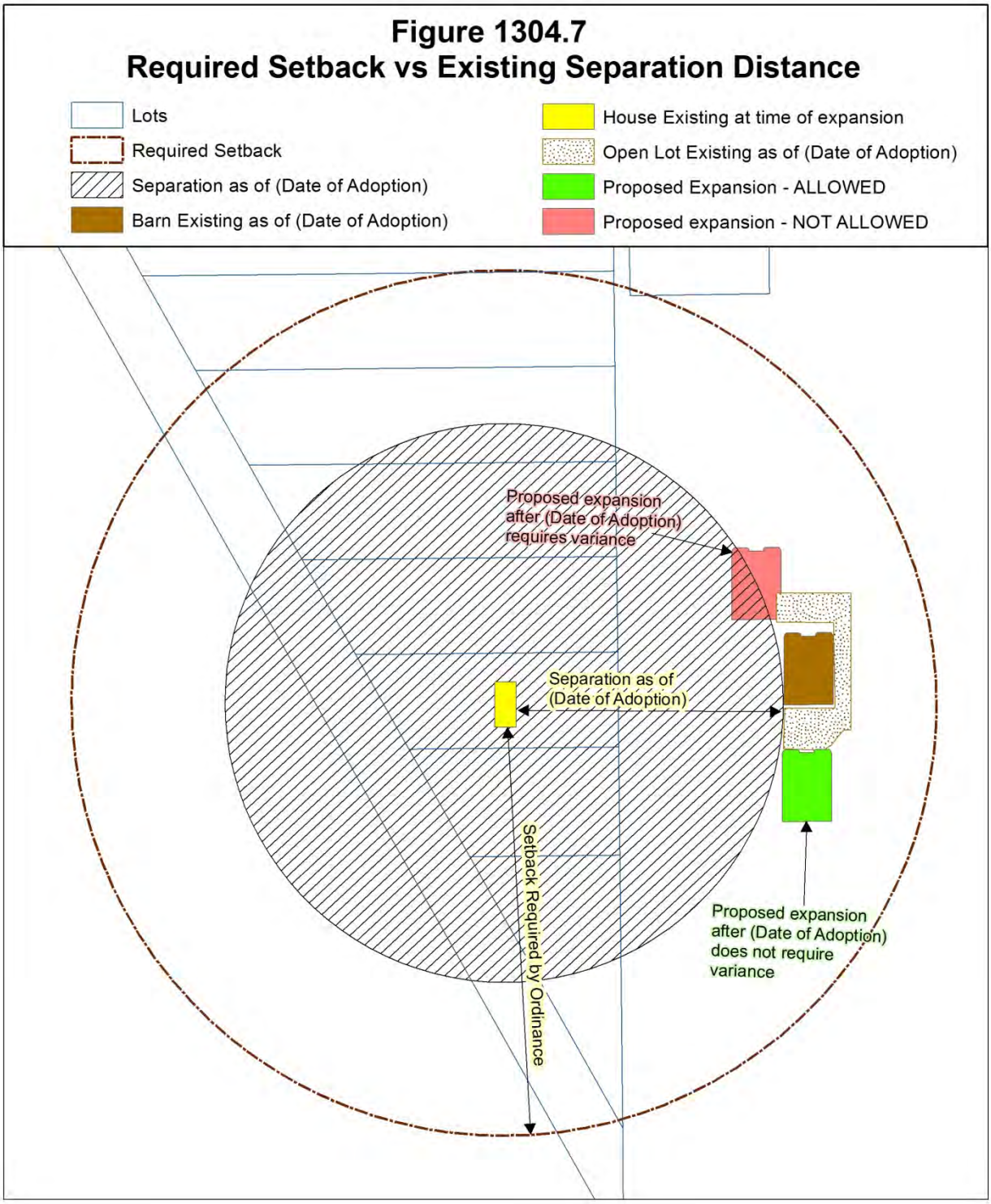
d. A Concentrated Animal Feeding Operation structure which existed prior to the creation of residence, educational institution, commercial enterprise, religious institution, incorporated community, if the residence, educational institution, commercial enterprise or religious institution was constructed or expanded or the boundaries of the incorporated community were expanded, after the date that the concentrated animal feeding operation was established. The date that the Concentrated Animal feeding Operation was established is the date on which the Concentrated Animal Feeding Operation commenced operating. A change in ownership or expansion shall not change the date of operation. [Ord. 2004-1, Rev. 2016-01]

e. A non-standard Concentrated Animal Feeding Operation (Class E) with or without a county issued permit is exempt from setback/separation distance requirements in the event of a calamity. The buildings and use areas associated with the non-standard Concentrated Animal Feeding Operation are allowed to be replaced if the separation is equal to or greater than the distance between the Concentrated Animal Feeding Operation and other existing uses requiring a separation distance on June 9, 2016. A vested Class E Concentrated Animal Feeding Operation is allowed to expand to a maximum size of one thousand nine hundred ninety-nine (1,999) animal units, subject to receiving a conditional use permit. Any expansion is allowed without having to obtain a variance from setback/separation requirements, provided the separation distance between the structure or use associated with the proposed Concentrated Animal Feeding Operation expansion is equal to or greater than the distance between the Concentrated Animal Feeding Operation and other existing uses requiring a separation distance on June 9, 2016. The replacement and expansion provisions contained herein do not apply to Concentrated Animal Feeding Operations situated over the Aquifer Protection Overlay District. See Figure 1304.7. [Ord. 2016-01, Rev. 2016-01A]

f. A vested Concentrated Animal Feeding Operation (Class D) is exempt from setback/separation distance requirements. The vested Concentrated Animal Feeding Operation is allowed an expansion not to exceed a cumulative total of three hundred (300) animal units without having to obtain a variance from setback/separation requirements. The expansion is allowed, provided the separation distance between the structure or use associated with the proposed Concentrated Animal Feeding Operation replacement/expansion is equal to or greater than the distance between the Concentrated Animal Feeding Operation and other existing uses requiring a separation distance on June 9, 2016. The expansion also shall conform to Section 11.05.05. See Figure 1304.7. [Ord. 2016-01, Rev. 2016-01A]

g. A vested Concentrated Animal Feeding Operation (Class C) with a county issued permit is exempt from setback/separation distance requirements. In the event of a calamity, the buildings and use areas associated with the vested Concentrated Animal Feeding Operation are allowed to be replaced. The vested Concentrated Animal Feeding Operation is allowed to expand to a maximum size of one thousand nine hundred ninety-nine (1,999) animal units. The replacement and/or expansion is allowed without having to obtain a variance from setback/separation requirements. The replacement and/or expansion is allowed without having to obtain a variance from setback/separation requirements, provided the separation distance between the structure or use associated with the proposed Concentrated Animal Feeding Operation replacement/expansion is equal to or greater than the distance between the Concentrated Animal Feeding Operation and other existing uses requiring a separation distance on (the Adoption date of ordinance). The replacement and expansion provisions contained herein do not apply to vested Concentrated Animal Feeding Operations situated over the Aquifer Protection Overlay District. See Figure 1304.7. [Ord. 2016-01, Rev. 2016-01A]

h. A vested Concentrated Animal Feeding Operation (Class A or Class B) with a county issued permit is exempt from setback/separation distance requirements. In the event of a calamity, the buildings and use areas associated with the vested Concentrated Animal Feeding Operation are allowed to be replaced. The replacement is allowed without having to obtain a variance from setback/separation requirements, provided the separation distance between the structure or use associated with the proposed Concentrated Animal Feeding Operation replacement/expansion is equal to or greater than the distance between the Concentrated Animal Feeding Operation and other existing uses requiring a separation distance on (the Adoption date of ordinance). The replacement of said Concentrated Animal Feeding Operation cannot exceed the number of animal units identified in the existing County Permit, unless a new permit is granted in accordance with Section 1304.7.a.iii or Section 1304.7.a.iv. The replacement and expansion provisions contained herein do not apply to vested Concentrated Animal Feeding Operations situated over the Aquifer Protection Overlay District. See Figure 1304.7. [Ord. 2016-01, Rev. 2016-01A]


Figure 1304.7
Required Setback vs Existing Separation Distance
Lots
Required Setback
Separation as of (Date of Adoption)
Barn Existing as of (Date of Adoption)
House Existing at time of expansion
Open Lot Existing as of (Date of Adoption)
Proposed Expansion - ALLOWED
Proposed expansion - NOT ALLOWED
Proposed expansion after (Date of Adoption) requires variance
Separation as of (Date of Adoption)
Setback Required by Ordinance
Proposed expansion after (Date of Adoption) does not require variance

[Ord. 2016-01]

8. **Additional Setback and Separation Distance Requirements for Class A, B, C, D, and E Concentrated Animal Feeding Operations.** [Ord. 2004-1 unless otherwise noted]

Each application for a new or expanded Concentrated Animal Feeding Operation will be reviewed by the Board of Adjustment on a site-specific basis. The Board of Adjustment reserves the right to increase or decrease the minimum required setbacks and separation distance on a site specific review, based on one (1) or more of the following considerations.

a. Considerations To Increase Setbacks And Separation Distances [Ord. 2004-1, Rev. 2016-01]

i. Existing Concentration - A Concentrated Animal Feeding Operation of two thousand (2,000) or more animal units is proposed to be located in an area where a concentration of three thousand (3,000) animal units currently exists within one (1) mile of the proposed Concentrated Animal Feeding Operation site.

In the event the Board determines that a concentration of animal units already exists and an increase in animal units may pose air or water quality concerns, the Board may utilize the South Dakota Odor Footprint Tool or other instrument developed and/or accepted by South Dakota State University and the Board of Adjustment to determine the need to increase setback and/or separation requirements. The Board may further:

a) Apply the established minimum setback subject to 1304.8.a.ii

b) Increase the established minimum setback based upon 1304.8.a.ii

c) Amend and approve the request for less than two thousand (2,000) animal units based upon 1304.8.a.ii.

d) Deny the request

ii. Due to topography and prevailing wind direction, and/or concentration of animal units, additional setback and separation distance is appropriate to safeguard air or water quality. The South Dakota Odor Footprint Tool or other instrument developed and/or accepted by South Dakota State University and the Board of Adjustment may be utilized to determine the need to increase setback and/or separation requirements. [Ord. 2004-1, Rev. 2016-01]

iii. Siting of a Concentrated Animal Feeding Operation is in excess of one thousand (1,000) animal units. [Ord. 2004-1, Rev. 2016-01]

In the event the Board determines that the siting of a CAFO, where one did not previously exist, with more than one thousand (1,000) animal units may pose air or water quality concerns, the Board may utilize the South Dakota Odor Footprint or other instrument developed and/or accepted by South Dakota State University and the Board of Adjustment to determine the need to increase setback and/or separation requirements. The Board may further:

a) Apply the established minimum setback subject to 1304.8.a.ii

b) Increase the established minimum setback based upon 1304.8.a.ii

c) Amend and approve the request for less than one thousand (1,000) animal units based upon 1304.8.a.ii

d) Deny the request

iv. Review of past management practices and proposed improvements to manure handling facilities.

b. Considerations To Decrease Setbacks and Separation Distances [Ord. 2004-1, Rev. 2016-01]

The Board of Adjustment may reduce minimum setback/separation distances of any new or existing Concentrated Animal Feeding Operation proposing to expand based upon any or all of the following considerations:

i. Review of the operation of the Concentrated Animal Feeding Operation as it pertains to the type of manure handling system and manure application methods to be used.

ii. Due to the type of manure handling and management of the CAFO little or no impact on adjacent property is expected. The use of Bio-filters, neoprene lagoon covers, and/or methane digesters are examples of improvements which may result in the reduction of recommended setbacks and separation distances. The South Dakota Odor Footprint Tool or other instrument developed and/or accepted by South Dakota State University and the Board of Adjustment may be utilized to determine the need to decrease setback and/or separation requirements.

iii. Due to topography and/or prevailing wind direction little or no impact on adjacent property is expected. The South Dakota Odor Footprint Tool or other instrument developed and/or accepted by South Dakota State University and the Board of Adjustment may be utilized to determine the need to decrease setback and/or separation requirements.

iv. By limiting the proposed expansion to specific number of animal units no adverse impacts are expected. The South Dakota Odor Footprint Tool or other instrument developed and/or accepted by South Dakota State University and the Board of Adjustment may be utilized to determine the need to decrease setback and/or separation requirements.

9. Manure Application Setbacks [Ord. 2004-1, Rev. 2004-1B, Rev. 2016-01]

a. Table 1304.2 provides the following manure application setbacks apply to all classes of Concentrated Animal Feeding Operations.

Table 1304.2

COUNTY MANURE APPLICATION SETBACKS

CATEGORY	SURFACE APPLIED	INCORPORATED OR INJECTED
Lakes, Rivers and Streams Classified as Fisheries	300 feet*	100 feet
Streams and Lakes Classified as Drinking Water Supplies	1,000 feet	300 feet
Public Roads	25 feet (surface) from right-of-way	10 feet from right-of-way
	300 feet (irrigation) from right-of-way	
Area of 10 or More Residences/Public Schools	300 feet (surface)	300 feet
	1,000 feet (irrigation)	
Public Wells	1,000 feet	1,000 feet
Established Private Water Well	250 feet	250 feet
A Residence Other Than the Operator	300 feet (surface)	300 feet
	1,000 feet (irrigation)	
Natural or Manmade Surface Drainage	200 feet*	50 feet

*Or as prescribed within the South Dakota General Permit for Manure Application on Saturated, Snow Covered, or Frozen Soil

b. The Board of Adjustment may require liquid manure to be incorporated or injected in order to minimize air and water quality impacts.

c. Requests for application of liquid manure by means of irrigation will be reviewed by the Board of Adjustment on a site-specific basis. Impact on air and water quality will be taken into consideration.

10. Standards for Conditional Uses

a. The Board of Adjustment may request information relating to a Concentrated Animal Feeding Operation not contained in these regulations. [Ord. 2004-1, Rev. 2016-01]

b. The Board of Adjustment may impose, in addition to the standards and requirements set forth in these regulations additional conditions which the Board of Adjustment considers necessary to protect the public health, safety and welfare. [Ord. 2004-1, Rev. 2016-01]

c. Conditional Use Permits for concentrated Animal Feeding Operations shall be in effect only as long as sufficient land specified for spreading purposes is available for such purposes and other provisions of the permit are being adhered to. [Ord. 2004-1, Rev. 2016-01]

d. When considering an application, the Board of Adjustment will take into consideration current and past violations, documented by the Environmental Protection Agency, the South Dakota Department of Environment and Natural Resources, or similar applicable agency in other states, in relating to Concentrated Animal Feeding Operations that the applicant has or had an interest in. [Ord. 2004-1, Rev. 2016-01]

e. Conditional Use Permit applicants will be required to file a letter of assurances as required by the Board of Adjustment. Class E (with at least 500 animal units) Concentrated Animal feeding operations established after June 9, 2016 are required to sign the letter of assurance as provided in Section 1306.01. The letter of assurances will be prepared by the zoning officer and/or Board of Adjustment and signed by both the applicant and the Board of Adjustment's designee. The permit for the concentrated animal feeding operation is based upon compliance with the regulations herein, and associated letter of assurances. Any violation of these regulations or non-compliance with the letter of assurances shall be cause for revoking a permit. If a violation of these regulations or non-compliance with the letter of assurance occurs, permit holders will be notified by registered mail and a hearing before the Board of Adjustment will be held concerning status of the permit. The Board of Adjustment shall either revoke the permit or set a time line for compliance. If compliance is not met, the permit shall be revoked and the permit holder ordered to cease operations. [Ord. 2004-1, Rev. 2016-01, Rev. 2016-01A]

11. The following information may be requested and reviewed by the Board of Adjustment prior to the issuance or as a condition to the issuance of a conditional use permit for any class of CAFO. [Ord. 2004-1, Rev. 2016-01A]

a. Owner(s)/Applicant(s) name, address and telephone number.

b. Legal descriptions of site and site plan.

c. Number and type of animals.

d. Preliminary Nutrient Management Plan, if required.

e. Preliminary manure management and operation plan, if required.

f. Preliminary management plan for fly and odor control, if required.

g. Information on ability to meet suggested setbacks and separation distances

h. As a condition of approval of any Concentrated Animal Feeding Operation over 1,000 animal units or as determined by the Board of Adjustment, the documentation of an approved General Permit from the South Dakota Department of Environment & Natural Resources for animal species is required. The issuance of a State General Permit satisfies the county's requirements for an approved nutrient management plan and manure management plan.

i. Documentation of notice to public water supply officials.

j. Information on soils, shallow aquifers, designated wellhead protection areas, and 100-year floodplain designation.

k. Documentation of notice to whomever maintains the access road (township, county and state).

l. Any other information as contained in the application and requested by the Zoning Officer.

Section 1305. Vesting of Concentrated Animal Feeding Operations [Ord. 2016-01, unless otherwise noted]

1. Grant County recognizes the vested right to utilize a property for the purpose of a concentrated animal feeding operation if:

   a. The owner or lawful agent was engaged in the operation of a concentrated animal feeding operation, with or without a county-issued permit on (Date of adoption of ordinance);

   b. The concentrated animal feeding operation was determined to be a nonconforming use due to setback/separation requirements established by Grant County on November 1, 1997 and/or was determined to be a non-conforming use due to minimum lot area requirements established by Grant County on September 15 2004 and/or was determined to be a non-standard use due to setback/separation requirements established by Grant County on June 9, 2016.

   c. The owner or lawful agent applies for a vested right claim, and applies for a zoning permit and signs a letter of assurance, if applicable, within two years after (Date of adoption of new ordinance).

2. Any person claiming to be the owner of a vested right to operate a concentrated animal feeding operation as defined herein may file a vested right claim with the form of said claim to be submitted, reviewed and approved in a manner prescribed by the Board of County Commissioners. At a minimum, the claim shall set forth the size of the concentrated animal feeding operation, the legal description of the land upon which the concentrated animal feeding operation was located and the name and owner of the land on (date of adoption of ordinance). The claim shall be signed under oath, and shall be either from the claimant's own personal knowledge or on information and belief. The vested right shall be recorded with the title of the property.

3. If the owner or lawful agent fails to acquire vested rights within the prescribed time, then zoning regulations adopted on November 1, 1997 and subsequent amendments will apply to his property.

4. The granting of a vested right allows the owner or lawful agent the ability to use a property for the purpose of a concentrated animal feeding operation in accordance with Section 1304.7.

5. The vested property right shall be considered abandoned and the vested property shall revert to a nonconforming land use status subject to Article IV of these Regulations if any of the following occur:

   a. The property is not used as a Concentrated Animal Feeding Operation for a period of two (2) years.

   b. The owner or lawful agent does not comply with the zoning permit and associated letter of assurance.

   c. The principle use of the property changes from agricultural use to a residential, commercial, industrial or public use. [Rev. 2016-01A]

Section 1306.01. Permitted Use Letter of Assurance. [Ord. 2016-01, Rev. 2016-01A]

As a requirement of Section 1304.10.e, the following letter of assurance is to be signed by the applicant and Designee of the Grant County Board of Adjustment prior to the issuance of a Class E (with at least 500 animal units) Concentrated Animal Feeding Operation Permit.

Prepared by:
Grant County Zoning Officer
Address
Milbank, SD 57252

Permitted Use Letter of Assurance

A Permit has been granted by the Grant County Zoning Officer to (Applicant Name) to operate a Class E Concentrated Animal Feeding Operation on property owned by (Applicant Name).

Property Location: _____

Standards and Conditions to be placed upon the Permit for a Class E Concentrated Animal Feeding Operation issued by the Grant County Zoning Officer on (date).

1. This Permit authorizes the use of the above described property for a Class E Concentrated Animal Feeding Operation consisting of (number animal units and species of animal)

2. The Concentrated Animal Feeding Operation site will comply with all setback requirements found in Article XIII, Section 1304.6 of the Grant County Zoning Ordinance.

3. The Concentrated Animal Feeding Operation will comply with all requirements of Section 1105 "Aquifer Protection Overlay District" of the Grant County Zoning Ordinance.

4. The applicant shall comply with the South Dakota Department of Environment and Natural Resources or Natural Resources Conservation Services Nutrient Management Plan and Manure Management Plan.

5. The applicant shall provide updated information regarding the Nutrient Management Plan and Manure Management Plan upon request of the Zoning Officer.

6. The applicant shall comply with all manure application setbacks per found in Section 1304.9 of the Grant County Zoning Ordinance.

7. The applicant shall provide and comply with a management plan for fly and odor control consistent Section 1304.5.

8. The applicant shall obtain a haul road agreement with the applicable road authority for construction and maintenance of roads associated with the Concentrated Animal Feeding Operation. Unless otherwise agreed to between the Road Authority and the applicant, at Grant County requires, at a minimum, the applicant to abide by the haul road agreement terms found Grant County Resolution #2014-36.

9. The Permit is transferable. Subsequent owners/operators will be required to agree to the terms of this permit.

10. The applicant may be required to forfeit the Permit in the event there are either

    a. Violations of the Permit or other Grant County Zoning regulations or

    b. Failure of the manure management facility.

11. Violation of the terms of this Permit will be determined by the Grant County Zoning Officer.

    a. The first violation substantiated by the Zoning Officer of this Permit may result in a notification letter stating the violation and a prescribed period of time to remove the violation. A second violation occurring within one (1) calendar year of the previous violation may result in a review of the validity of the Permit and potential revocation of said permit. A third violation within one (1) calendar year of the initial violation may result in revocation of the Permit and cessation of all CAFO operations within forty-five days (45) of notice of revocation.

    b. The applicant may make appeal from the decision of the Zoning Officer or other agent of the Grant County Board of Adjustment to the Grant County Board of Adjustment. The applicant shall file with the Zoning Officer a notice of appeal specifying the grounds thereof. The Zoning Officer shall forthwith transmit to the Board of Adjustment all papers constituting the record upon which the action appealed from was taken. Such appeal shall be taken within thirty (30) days. Appeals from the Board of Adjustment shall be taken to Circuit Court.

    c. Failure to comply with the decision of the Zoning Officer or other agent of the Grant County Board of Adjustment may be deemed a separate violation.

IN WITNESS WHEREOF, Grant County and the Grantor(s) have executed this Letter of Assurance.

_____ _____
Applicant (Grantor) Date

_____ _____
Chairperson Date
Grant County Board of Adjustment

STATE OF SOUTH DAKOTA
SS:
COUNTY OF GRANT

This instrument was acknowledged before me on _____, 20__ by (Applicant), Grantor.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

_____ Notary Public
My Commission Expires: _____

STATE OF SOUTH DAKOTA
SS:
COUNTY OF GRANT

This instrument was acknowledged before me on _____, 20__ by ____, representing Grant County as the Chairperson of the Grant County Board of Adjustment.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

_____ Notary Public
My Commission Expires: _____

ORDINANCE #65
ZONING ORDINANCE

FOR

CODINGTON COUNTY

PREPARED BY

THE CODINGTON COUNTY PLANNING COMMISSION

WITH ASSISTANCE FROM
THE FIRST DISTRICT ASSOCIATION OF LOCAL GOVERNMENTS

Text in highlight and ~~strikethrough~~ font to be removed from Ordinance #15
Text in highlight, **bold**, and/or underline font to be added from Ordinance #15

~~SECTION~~ ARTICLE I
GENERAL PROVISIONS

~~This Ordinance, from the date of its passage, shall be for the purpose of promoting the health, safety, morals, and general welfare of the people in the unincorporated areas of Codington County, South Dakota. To this end, this Ordinance will lessen the congestion from fire, panic, and other dangers; providing adequate light and air; preventing the overcrowding of land; avoiding undue concentration of population; facilitating the adequate provision of transportation, water and sewerage, schools, parks, and other public requirements; regulation and restricting the height, number of stories, and bulk of building and other structures; the percentage of lots that may be occupied; the size of yards, courts, and other open spaces; the location and use of other purposes; and regulating and restricting the erection, construction, reconstruction, alteration, repair, and use of building, structures, and land.~~

CHAPTER 1.01. TITLE AND APPLICATION.

Section 1.01.01. Title.

This Ordinance may be known and may be cited and referred to as the "Codington County Zoning Ordinance" to the same effect as if the full title were stated.

Section 1.01.02. Jurisdiction.

Pursuant to SDCL 11-2, 1967, as amended, the provisions of this Ordinance shall apply within the unincorporated areas of Codington County, South Dakota, as established on the map entitled "The Official Zoning Map of Codington County, South Dakota."

Section 1.01.03. Purpose.

The Zoning Ordinance is adopted to protect and to promote the public health, safety, peace, comfort, convenience, prosperity and general welfare. More specifically, the Zoning Ordinance is adopted in order to achieve the following objectives:

1. To assist in the implementation of Codington County's Comprehensive Land Use Plan which in its entirety represents the foundation upon which this Ordinance is based.

2. To foster a harmonious, convenient, workable relationship among land uses.

3. To promote the stability of existing land uses that conform with the Comprehensive Land Use Plan and to protect them from inharmonious influences and harmful intrusions.

4. To insure that public and private lands ultimately are used for the purposes which are most appropriate and most beneficial from the standpoint of the "county community" as a whole.

5. To prevent excessive population densities and overcrowding of the land with structures.

6. To protect and enhance real estate values.

7. To facilitate the adequate provision of transportation, water and sewerage, schools, parks, and other public requirements;

8. To regulate and restrict the height, number of stories, and bulk of building and other structures; the percentage of lots that may be occupied; the size of yards, courts, and other open spaces; and the location and use of other purposes;

9. To regulate and restrict the erection, construction, reconstruction, alteration, repair, and use of building, structures, and land.

10. To place the power and responsibility of the use of land in the hands of the property owner contingent upon the compatibility of surrounding uses and the Comprehensive Land Use Plan.

CHAPTER 1.02. ORDINANCE PROVISIONS.

Section 1.02.01. Provisions of Ordinance Declared to be Minimum Requirements.

In their interpretation and application, the provisions of this Ordinance shall be held to be minimum requirements, adopted for the promotion of the public health, safety, morals, or general welfare. Wherever the requirements of this Ordinance are at variance with the requirements of any other lawfully adopted rule, ordinance, or Board of Adjustment decision, the most restrictive or that imposing the higher standards, shall govern.

Section 1.02.02. Purpose of Catch Heads.

The catch heads appearing in connection with the foregoing sections are inserted simply for convenience, to serve the purpose of an index and they shall be wholly disregarded by any person, officer, court or other tribunal in construing the terms and provisions of this Ordinance.

Section 1.02.03. Violation and Penalty.

1. Violations of the ordinance shall be treated in the manner specified below.

    a. Any person who starts work for which a permit (building, conditional use, variance, rezoning) is required by this Zoning Ordinance, without first securing such permit and paying the prescribed fee, shall be charged according to the provisions of this section. All fees assessed there under shall be rounded to the nearest whole dollar.

        i. Upon finding such violation, Codington County Planning and Zoning Staff shall notify the owner of property involved verbally or by sending a written notification of the requirement that a permit be obtained to the owner of the property involved by certified mail with return receipt requested. If application for said permit is filed within seven (7) working days from the verbal notification or date of receipt of the letter, an administrative fee shall be assessed in the amount of one hundred percent (100%) of the normal fee for the associated building permit, variance, conditional use, and/or rezoning plus the cost of the postage for mailing the aforementioned notice. In no case shall this administrative fee be less than five dollars ($5.00), including the postage

costs.

ii. If application for said permit is filed after the deadline of seven (7) working days following the verbal notice or receipt of the notification of the requirement therefore, there shall be imposed an administrative fee in the amount of two (2) times the normal fee for the associated building permit, variance, conditional use, and/or rezoning building permit fee plus the cost of the postage for mailing the aforementioned notice. The payment of the administrative fee shall not relieve such person from the provisions of paragraph (b) below.

iii. Any administrative fee or penalty imposed under the provisions of this Zoning Ordinance shall be in addition to any other fees or charges required under this Zoning Ordinance.

b. It is declared unlawful for any person to violate any of the terms and provisions of these regulations or other official control adopted by the Board of County Commissioners pursuant thereto. Any person who violates, disobeys, omits, neglects or refuses to comply with or resists the enforcement of any provision of this Zoning Ordinance may be subject to a civil or criminal penalty. The penalty for violation of this Zoning Ordinance shall be two hundred dollars ($200.00) or imprisonment for not more than thirty (30) days, or both, and in addition the violator shall pay all costs and expenses involved in the case. Each and every day that such violation continues after notification may constitute a separate offense. All fines for violation shall be paid to the County Auditor and shall be credited to the General Fund of the County.

c. In the event, any building or structure is erected, constructed, reconstructed, altered, repaired, converted or maintained, or any building, structure or land is used in violation of these regulations, the appropriate authorities of Codington County in addition to other remedies, may institute injunction, mandamus or other appropriate actions or proceedings in a court of competent jurisdiction to prevent, restrain, correct or abate such violation or threatened violation

d. Any taxpayer of the County may institute mandamus proceedings in Circuit Court to compel specific performance by the proper official or officials of any duty required by these regulations.

Section 1.02.04. Separability Clause.

Should any article, chapter, section, or provision of this ordinance be declared by the courts to be unconstitutional or invalid, such decision shall not affect the validity of the ordinance as a whole, or any part other than the part so declared to be unconstitutional or invalid.

Section 1.02.05. Repeal of Conflicting Ordinances.

All ordinances or resolutions or part of ordinances or resolutions in conflict with this Ordinance or inconsistent with the provisions of this Ordinance are repealed entirely.

Section 1.02.06. Effective Date.

This Ordinance shall take effect and be in force from and after its passage and publication according to law.

CHAPTER 1.03. OFFICIAL ZONING MAP.

Section 1.03.01. Official Zoning Map.

1. The **unincorporated area of the** County is hereby divided into zones, or districts, as shown on the Official Zoning Map **and Official Map of the Rural Residential District** which, together with all explanatory matter thereon, is hereby adopted by reference and declared to be a part of this Ordinance. The Official Zoning Map shall be identified by the signature of the Chairperson of the Board of County Commissioners attested by the County Auditor and bearing the seal of the County under the following words: "This is to certify that this is the Official Zoning Map referred to in Chapter ~~6.3~~ **1.03** of Ordinance Number **65**~~15~~ of Codington County, State of South Dakota," together with the date of the adoption of this Ordinance. The Official Zoning Map shall be on file at the office of the County Auditor. **Further, the Official Map of the Rural Residential District shall be identified by the signature of the Chairperson of the Board of County Commissioners attested by the County Auditor and bearing the seal of the County under the following words: "This is to certify that this is the Official Map of the Rural Residential District referred to in Chapter 1.03 of Ordinance Number 65~~55~~, an Amendment to Ordinance Number 15~~30~~ of Codington County, State of South Dakota," together with the date of the adoption of this Ordinance."**

2. Regardless of the existence of purported copies of the Official Zoning Map which may from time to time be made or published, the Official Zoning Map, which shall be located in the office of the County Auditor ~~offices~~, shall be the final authority as to the current zoning status of land and water areas, buildings, and other structures in the County.

Section 1.03.02. Amendment of the Official Zoning Map.

1. If, in accordance with the provisions of this Ordinance changes are made in district boundaries or other matter portrayed on the Official Zoning Map, such changes shall be entered on the Official Zoning Map promptly after the amendment has been approved by the Board of County Commissioners, **with an entry on the Official Zoning Map as follows: "On (date of adoption) by official action of the Board of County Commissioners, the following change(s) were made on the Official Zoning Map:" (brief description of nature of change), which entry shall be signed by the Chairman of the Board of County Commissioners and attested by the County Auditor** ~~and has become law according to the statutes of the State of South Dakota~~.

2. No amendment of this Ordinance which involves matter portrayed on the Official Zoning Map shall become effective until after such change and entry has been made on the Official Zoning Map.

3. No changes of any nature shall be made on the Official Zoning Map or matter shown thereon except with conformity with the procedure set forth in this Ordinance. Any unauthorized change of whatever kind by any person or persons shall be considered a violation of this Ordinance ~~and punishable as provided by this Ordinance~~.

Section 1.03.03. Interpretation of District Boundaries.

Where uncertainty exists as to the boundaries of districts as shown on the Official Zoning Map, the following rules shall apply:

1. **A district name or letter symbol shown on the district map indicates that the regulations pertaining to the district designated by that name or symbol extend throughout the whole area in the unincorporated portions of the County bounded by the district boundary lines.**

2. **Boundaries indicated at approximately following the center lines of streets, highways, or alleys, shall be construed to follow such center lines;**

3. **Boundaries indicated as approximately following platted lot lines shall be construed as following such lot lines;**

4. **Boundaries indicated as approximately following city limits shall be construed as following such city limits;**

5. **Boundaries indicated as following railroad lines shall be construed to be midway between the main tracks;**

6. **Boundaries indicated as following shore lines shall be construed to follow such shore lines, and in the event of change in the shore line shall be construed as moving with the actual shore line; boundaries indicated as approximately following the center lines of streams, rivers, canals, lakes, or other bodies of water shall be construed to follow such center lines;**

7. **Boundaries indicated as parallel to or extensions of features indicated in subsections 1 through 6 above shall be so construed. Distances not specifically indicated on the Official Zoning Map shall be determined by the scale of the map; and**

8. **Where physical or cultural features existing on the ground are at variance with those shown on the Official Zoning Map, or in other circumstances not covered by subsections 1 through 7 above, the Board of Adjustment shall interpret the district boundaries.**

Section 1.03.04. Changes and/or Replacement of Official Zoning Map.

In the event that the Official Zoning Map becomes damaged, destroyed, lost or difficult to interpret because of the nature or number of changes and additions, the Board of County Commissioners may by ordinance adopt a new Official Zoning Map, which shall supersede the prior Official Zoning Map. The new Official Zoning Map may correct drafting or other errors or omissions in the prior Official Zoning Map, but no such corrections shall have the effect of amending the original Official Zoning Map or any subsequent amendment thereof.

The new Official Zoning Map shall be identified by the signature of the Chairperson attested by the County Auditor, and bearing the seal of the County under the following words: "This is to certify that this Official Zoning Map supersedes and replaces the Official Zoning Map adopted (date of adoption of map being replaced) as part of the Zoning Ordinance of Codington County, State of South Dakota."

Unless the prior Official Zoning Map has been lost, or has been totally destroyed, the prior map or any significant parts thereof remaining shall be preserved together with all available records pertaining to its adoption or amendment.

~~SECTION~~ ARTICLE II
DEFINITIONS

~~For the purpose of this Regulation, certain terms and words are herein defined as follows, except where the context would plainly indicate a different intent:~~

For the purpose of this Ordinance, certain terms and words are hereby defined. Words used in the present tense shall include the future; the singular number shall include the plural and the plural the singular; the word "building" shall include the word "structure", the word "shall" is mandatory and not discretionary; the word may is permissive; the word person includes a firm, association, organization, partnership, trust, company or corporation, as well as, an individual; the word lot includes the word plat or parcel; and the words used or occupied include the words intended, designed, or arranged to be used or occupied. Any word not herein defined shall be as defined in any recognized Standard English dictionary.

Accessory Buildings and Uses. ~~An accessory building is a subordinate building, or portion of the main building, the use of which is incidental or subordinate to that of the main building.~~ **A subordinate building or portion of the principal building, the use of which is incidental to and customary in connection with the principal building or the main use of the premises and which is located on the same lot with such principal building or use. An accessory use is a use which is incidental to the main use of the premises.**

Accessory Uses/buildings: Accessory uses and/or buildings are those buildings and uses customarily incident to any permitted use in the district.

Adult. A person, one who has reached the age of eighteen (18).

Adult Amusement or Entertainment. Amusement or entertainment which is distinguished or characterized by an emphasis on material depicting, describing or relating to 'specified sexual activities' or 'specified anatomical areas' or which features topless dancers, exotic dancers, strippers, male or female impersonators, or similar entertainment.

Adult Bookstores. An establishment having, as a substantial portion of its stock in trade, books, magazines, films or videotapes for sale or viewing on the premises by use of motion picture devices or other coin-operated means, and other periodicals which are distinguished by their emphasis on matter depicting, describing or relating to specified Sexual Activities or Specified Anatomical Areas as such terms are defined in this section, or an establishment with a segment or section devoted to the sale or display of such material. Adult bookstores may alternatively or in conjunction with the above stock in trade sell undergarments and other clothing designed for the display of Specified Anatomical Areas or for the enhancement of Specified Sexual Activities. Further, an adult bookstore may alternatively or in conjunction with the above stock in trade sell prosthetic devices, dolls, candles, vibrators and other objects for sexual gratification which take the form of Specified Anatomical Areas and for the purpose of enhancing Specified Sexual Activities.

Adult Entertainment Cabaret. Means an establishment offering to its patrons, as entertainment, any exhibition or display or any theatrical or other live performances which include topless or go-go dancers, exotic dancers, strippers, male or female impersonators, or similar entertainers, or any persons singing, reading, posing,

modeling, or serving food or beverages, where the exhibition, performance, display or dance is intended to sexually arouse the entertainer or the patrons, or where the attire of persons involved is such as to expose specified anatomical areas, as defined in this section.

Adult Motion Picture Theater. An enclosed building, regardless of its seating capacity, which is used to present for public view on the premises, films, movies, previews, trailers or advertisements which are distinguished by their emphasis on matter depicting, describing or relating to specified sexual activities or specified anatomical areas, as defined in this section.

Adult Photo Studio. An establishment which, on payment of a fee, provides photographic equipment and/or models for the purpose of photographing "specified anatomical areas", as herein defined.

Adult Use. The term "adult use" shall include adult entertainment cabaret, adult bookstores, adult motion picture theaters, and adult photo studios as defined in this section.

Agriculture. The use of land for agricultural purposes including farming, dairying, raising, breeding, or management of livestock, poultry, or honey bees, truck gardening, forestry, horticulture, floriculture, viticulture, and the necessary accessory uses for packaging, treating or storing the produce providing that the operation of any such accessory use shall be secondary to the normal agricultural activities. This definition shall not include intensive agricultural activities such as concentrated animal feeding operations and agribusiness activities.

Airport. A place where aircraft can land and takeoff, usually equipped with hangers, facilities for refueling and repair, and various accommodations for passengers, including heliports.

Animal Manure. Poultry, livestock, or other animal excreta or mixture of excreta with feed, bedding or other materials.

Animal Unit. See Section 5.1~~4~~**21**.

Animal Waste, Incorporated. Animal waste applied to the land surface and mechanically mixed into the soil within 24 hours.

Animal Waste, Injected. Animal waste injected or tilled into the soil at the time of application.

Animal Waste, Surface Applied. Animal waste applied to the land surface without benefit of incorporation or injection. This shall not include the use of animal waste in irrigation waters.

Animal Husbandry. The dairying, raising of livestock, breeding or keeping of animals, fowl or birds as a business for gainful occupation.

Applicant (when used in regard to concentrated animal feeding operations). An individual, a corporation, a group of individuals, partnership, joint venture, owners, or any other business entity having charge or control of one or more concentrated animal feeding operations.

Area of Special Flood Hazard. Means the land in the floodplain subject to a one (1) percent or greater chance of flooding in any given year. The area of a special flood hazard refers top the area subject to inundation during the base 100-year flood.

Bar/Tavern. An establishment that is licensed to sell alcoholic beverages by the drink.
Base Flood. Base Flood means the flood having a one (1) percent chance of being equaled or exceeded in any given year.

Basement. A basement has more than one-half (½) of its height below grade. A basement is counted as a story for the purpose of height regulations if subdivided and used for dwelling purposes.

Bed and Breakfast ~~Home~~ (B & B's). ~~An owner occupied home in which not to exceed five (5) rooms are rented.~~ **A private single-family residence, which is used to provide, limited meals and temporary accommodations for a charge to the public. Such establishments should be located where there will be minimal impact on surrounding properties and should comply with the following conditions:**

1. **B & B's shall be limited to residential structures with an overall minimum of one thousand eight hundred (1,800) square feet of floor. Preference will be given to structures with historic or other unique qualities.**

2. **They shall be in compliance with applicable state laws including registration with the South Dakota Department of Health, maintaining a guest list, and providing a smoke detector in each sleeping room.**

3. **Accessory use signs shall be based on similar requirements for a home occupation permit and shall not be more than sixteen (16) square foot in area.**

4. **Such uses shall be an incidental use with an owner occupied principal dwelling structure provided that not more than four (4) bedrooms in such dwelling structure shall be used for such purpose.**

5. **Off-street parking requirements shall be one (1) space per guestroom and shall be in addition to parking requirements for the principal use. Off-street parking shall not be located in a required front or side yard and screening shall be required when adjacent to residentially used property.**

6. **The length of stay shall not exceed fourteen (14) days during any one hundred twenty (120) day consecutive period.**

7. **Meals shall be limited to breakfast, which is prepared in a common facility (household kitchen). Meals may be served only to overnight registered guests and cooking is not permitted in the sleeping rooms.**

8. **The building shall meet all building codes and zoning requirements. A site plan showing the location of guest parking spaces and floor plan showing a location of the**

sleeping rooms, lavatories, and bathing facilities, and kitchen shall be submitted with application.

Best Management Practices. Measures contained in Soil Conservation Service South Dakota Technical Guide, either managerial or structural, that are determined to be the most effective, practical means of preventing or reducing pollution inputs from non-point sources to water bodies.

Board of County Commissioners. The governing body of Codington County.

Buildable Area. That portion of the lot that can be occupied by the principal use, thus excluding the front, rear, and side yards.

Building. The word "building" includes the word "structure" and is a structure which is entirely separated from any other structure by space or by walls in which there are no communicating doors, windows, or similar openings **and is designed for the support, shelter and protection of persons, animals, or property**.

Building, Height of. The vertical distance from the grade to the highest point of the coping of a flat roof or to the deck line of a mansard roof, or to the mean height level between the eaves and ridge for gable, hip and gambrel roofs.

Campground. Shall mean a plot of ground for public use upon which two or more campsites are located, established, maintained, advertised, or held out to the public, to be a place where camping units an be located and occupied as temporary living quarters. Campgrounds for tent trailers and recreational vehicles should be sited with consideration for access to the property. The campground should be designed to minimize the impact from adjacent major thoroughfares.

Change in Operation. Change in operation means a cumulative increase of more than **three hundred** (300) animal units, or change in animal species, after July 1, 1997, which are confined at an unpermitted concentrated animal feeding operation.

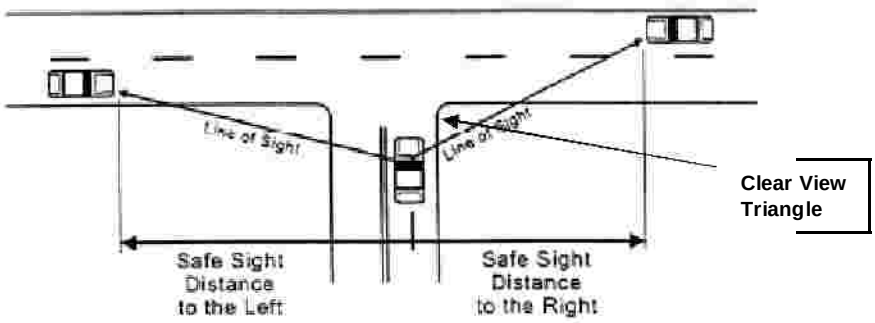
Chemigation. The process of applying agricultural chemicals (fertilizer or pesticides) through an irrigation system by injecting the chemicals into the water.

Church. A building wherein persons regularly assemble for religious worship and which is maintained and controlled by a religious body organized to sustain public worship, together with all accessory buildings and uses customarily associated with such primary purpose. Includes synagogue, temple, mosque, or other such place for worship and religious activities

Class V Injection Well. A conduit through which potentially contaminated but generally non-hazardous fluids can move below land surface into or above an aquifer. The types of primary concern in Codington County are 5W20-industrial process water and waste disposal wells and 5X28-automobile service station disposal wells. Typically, 5W20 types are commercial/ industrial facility septic tanks used to dispose of more than domestic wastewater. 5X28 types are dry wells for wastes from repair bay drains at facilities servicing internal combustion vehicles and equipment.

Clear View Triangle. A triangular-shaped portion of land established at street intersections and ingress/egress points in which there are restrictions on things erected,

placed or planted which would limit or obstruct the sight distance of motorists entering or leaving the intersection (see illustration below).



Closed Zoning District. A zoning district for which amendment to the district boundaries may only be initiated by the Planning Commission.

Club, Private. Building and facilities owned or operated by a corporation, association, person, or persons for a social, educational, or recreational purpose, but not primarily for profit and not primarily to render a service which is customarily carried on as a business. The structure is not available for public use or participation.

Commercial Vehicles. Any motor vehicle licensed by the state as a commercial vehicle.

Comprehensive Plan. The adopted long-range plan intended to guide the growth and development of Codington County.

Concentrated Animal Feeding Operation. A Concentrated Animal Feeding Operation is defined as a lot, yard, corral, building or other area where animals have been, are, or will be stabled or confined for a total of forty-five (45) days or more during any twelve (12)-month period, and where crops, vegetation, forage growth, or post harvest residues are not sustained over any portion of the lot or facility. Two (2) or more animal feeding operations under common ownership are single animal operation if they adjoin each other, or if they use a common area, or if they use a common area or system for disposal of manure.

Conditional Use. A conditional use is any use that, owing to certain special characteristics attendant to its operation, may be permitted in a zoning district subject to requirements that are different from the requirements imposed for any use permitted by right in the zoning district. Conditional uses are subject to the evaluation and approval by the Board of Adjustment and are administrative in nature

Contamination. The process of making impure, unclean, inferior or unfit for use by introduction of undesirable elements.

Contingency Plans. Detailed plans for control, containment, recovery and clean up of hazardous materials released during floods, fires, equipment failures, leaks and spills.

Contractor Shops and Yards. Those facilities to include structures and land areas where the indoor or outdoor storage of equipment and supplies used for various types of construction are stored. Examples of equipment and supplies include but are not limited to the following – road construction, building construction, gravel operations, and

general contracting services.

Convenience Store. Any retail establishment offering for sale pre-packaged food products, household items, and other goods commonly associated with the same, at which a customer typically purchases only a few items during a short visit.

Density. The number of families, individuals, dwelling units, or housing structures per unit of land.

Development. The carrying out of any surface or structure construction, reconstruction or alteration of land use or intensity of use.

~~**District**. A section or sections of the County for which the regulations governing the use, the construction, and location of buildings and the occupancy of buildings and premises are the same.~~

District, Zoning. A section or sections of the County for which regulations governing the use of buildings and premises, the height of buildings, the size of yards, and the intensity of use are uniform.

~~**Dog Kennel.** A commercial or non-commercial establishment where more than three adult dogs are kept boarded.~~

Domestic Sanitary Sewage Treatment Facility. Shall mean the structures equipment and processes required to collect, carry away, and treat and dispose of domestic wastewater, industrial wastes, and or sludge.

Dwelling. Any building, including seasonal housing structures, or a portion thereof, which is designed and used exclusively for residential purposes. This definition does not include a mobile home or manufactured home.

Dwelling, Farm. Any dwelling owned or occupied by the farm owners, operators, tenants, or seasonal or year-around hired workers.

Dwelling, Multiple-family. A building occupied by two (2) or more families.

Dwelling, Non-Farm. Any occupied dwelling which is not a farm dwelling.

Dwelling, Single-Family. A building occupied exclusively by one (1) family.

Dwelling. One (1) or more rooms, containing sleeping quarters, in a dwelling occupied as separate living quarters by a single-family.

Electrical Substation. A premises which may or may not contain buildings, where the interconnection and usual transformation of electrical service takes place between systems. An electrical substation shall be secondary, supplementary, subordinate, and auxiliary to the main system.

Eligible Building Site (Building Eligibility). A site which fulfills the requirements for the construction or placement of a building.

Engineer. Means any engineer licensed by the State of South Dakota.

Essential Public Services. Overhead or underground electrical, gas, steam or water transmission or distribution systems and structures, or collection, communication, supply or disposal systems and structures used by public for protection of the public health, safety or general welfare, including towers, poles, wires, mains drains, sewers, pipes, conduits, cables satellite dishes, and accessories in connection therewith.

Established Residence. A dwelling established before June 30, 1997 or a dwelling located greater than one-half (1/2) mile from any existing concentrated animal feeding operation at the time of the dwelling's construction.

Existing Farmstead. An existing farmstead shall include a livable house occupied by the owner or tenant within the last three (3) years and shall have been existing on the site for at least five (5) years and the site shall have been used in the past as a farmstead for normal farming operation. **In addition** the ~~Planning Commission~~ **Board of Adjustment** may consider defining an identifiable parcel as an existing farmstead if the proposed site meets the following criterion:

1. Evidence that the proposed site was once used for human habitation **within the last fifty 50) years**. This may be determined by existence of buildings/foundations ~~and/or an established shelterbelt~~.
2. **Evidence that the proposed site was used as a farmstead supporting normal farming operations prior to October 26, 1976.**

3. Information regarding the location of flood plain, access to roads and utilities, and other appropriate site information may be considered by the ~~Planning Commission~~ **Board of Adjustment** in determining the suitability of the parcel for development.

Extended Home Occupation. A home occupation conducted outside of the residence and/or in an accessory building

Facility. Something built, installed or established for a particular purpose.

Family. ~~One or more individuals living, sleeping, cooking, or eating on the premises as a single housekeeping unit; however, it shall not include a group of more than two (2) individuals not related by blood or marriage.~~ **One (1) or more persons related by blood, marriage, or adoption occupying a dwelling unit as a single household unit. A family shall not include more than three (3) adults who are unrelated by blood or law. This definition shall not include foster families as regulated by the State of South Dakota.**

Farm. An area with or without a dwelling which is used for the growing of the usual farm products, such as vegetables, fruit, trees and grain, and their storage on the area, as well as for the raising, feeding, or breeding thereon of the usual farm poultry and farm animals, such as horses, cattle, sheep and swine all of the foregoing farm products and animals are raised for income. The term "farming" includes the operating of such an area for one or more of the above uses, including dairy farms with the necessary accessory uses for treating or storing the produce; provided, however, that the operation of such accessory uses shall be secondary to that of the normal farming activities.

Fence. A structure used as a boundary, screen, separation, means of privacy, protection or confinement, and is constructed of wood, plastic, metal, wire mesh, masonry or other similar materials and is used as a barrier of some sort.

Firearm. Means a gun that discharges shot, bullet or other projectile by means of an explosive, gas, compressed air, or other propellant.

Five-Year Time of Travel Distance. The distance that ground water will travel in five years. This distance is a function of aquifer permeability and water table slope.

Flood or Flooding. Means a general and temporary condition of partial or complete inundation of normally dry land areas from:

1. The overflow of inland or tidal waters and/or

2. The unusual and rapid accumulation of runoff of surface waters from any source.

Flood Insurance Rate Map (FIRM). Means an official map of a community on which the Federal Emergency Management Agency has delineated areas of special flood hazard designated as Zone A.

Floodway. The channel and the adjacent areas that must be reserved in order to meet the minimum requirement of the National Flood Insurance Program of providing for the discharge of the base flood without cumulatively increasing the water surface elevation more than one (1) foot. However if there are identifiable flood impacts either upstream or downstream, based upon a scientific engineering study, a more stringent definition of floodway may be justified. That definition would include the channel and the adjacent areas that must be reserved in order to provide for the discharge of the base flood without cumulatively increasing the water surface elevation to a point which may result in additional damages to upstream/downstream properties.

Frontage. All the property on one (1) side of a street or road.

~~**Front Yard**: A yard extending between the side lot lines across the front of a lot adjoining a public right-of-way. In the case of corner lots, front yards shall be provided on both streets.~~

Game Lodge. A building or group of two (2) or more detached, or semi-detached, or attached buildings occupied or used as a temporary abiding place of sportsmen, hunters and fishermen, who are lodged with or without meals, and in which there are sleeping quarters.

Garage, Private. An accessory building used for the storage of not more than four (4) vehicles owned and used by the occupant of the building to which it is necessary. Vehicles include cars, pickups, trailers, and boats.

Governmental Agency. An organized entity which, in addition to having governmental character, has sufficient discretion in the management of its own affairs to distinguish it as separate from the administrative structure of any other governmental unit. This definition shall be deemed to include, but is not limited to Codington County, the State of South Dakota, and any School District or Municipality located in Codington County.

Grade. The finished grade of premises improved by a building **or structure** is the **average natural** elevation **or slope** of the surface of the ground **within fifty (50) feet** ~~adjoining~~ **of** the building **or structure**.

Greenhouse. A building whose roof and sides are made largely of glass or other transparent or translucent material and in which the temperature and humidity can be regulated for the cultivation of delicate or out-of-season plants for subsequent sale or for personal enjoyment.

Grey Water. All domestic wastewater except toilet discharge water.

Ground Water. Subsurface water that fills available openings in rock or soil materials such that it may be considered water saturated.

Group Home. A supervised living or counseling arrangement in a family home context providing for the twenty-four (24) hour care of children or adults.

Hazardous Materials. A material which is defined in one or more of the following categories:

A. Ignitable: A gas, liquid or solid which may cause fires through friction, absorption of moisture, or which has low flash points. Examples: white phosphorous and gasoline.

B. Carcinogenic: A gas, liquid or solid which is normally considered to be cancer causing or mutagenic. Examples: PCBs in some waste oils.

C. Explosive: A reactive gas, liquid or solid which will vigorously and energetically react uncontrollably if exposed to heat, shock, pressure or combinations thereof. Examples: dynamite, organic peroxides and ammonium nitrate.

D. Highly Toxic: A gas, liquid or solid so dangerous to man as to afford an unusual hazard to life. Examples: parathion and chlorine gas.

E. Moderately Toxic: A gas, liquid or solid which through repeated exposure or in a single large does can be hazardous to man. Example: atrazine.

F. Corrosive: Any material, whether acid or alkaline, which will cause severe damage to human tissue, or in case of leakage might damage or destroy other containers of hazardous materials and cause the release of their contents. Examples: battery acid and phosphoric acid.

~~**Height of Building**. The height of a building shall be the vertical distance measured, in the case of flat roofs, from the mean level of the established grade to the level of the highest point of the roof beam adjacent to the street, and in the case of a pitched roof, from such grade to the mean height level of the upper side of the rafters of the roof. Where no roof beams exist or there are structures wholly or partially above the roof, the height shall be measured from the established grade to the level of the highest point of the building.~~

Home Occupation. An occupation engaged in by the occupants of a dwelling provided that:

A. No person other than members of the family residing on the premises shall be engaged in such occupation;

B. The use of the dwelling unit for the home occupation shall be clearly incidental and subordinate to its use of residential purposes by its occupants, and not more than twenty-five (25) percent of the floor area of the dwelling unit shall be used in the conduct of the home occupation;

C. There shall be no change in the outside appearance of the building or premises, or other visible evidence of the conduct of such home occupation other than one (1) **on-premise** sign, not to exceed ~~four~~ **sixteen (16)** square feet in area, non-illuminated.

D. Off premise signage for home occupations shall be limited to South Dakota Department of Transportation (SDDOT) commercial, directional signs, also known as "Blue Signs". These signs, with SDDOT approval, may be located adjacent to State and Federal Highways.

~~D.~~**E.** No home occupation shall be conducted in any accessory building. ~~in connection with a non-farm dwelling. Accessory building use in connection with a farm dwelling shall be agricultural-related;~~

~~E.~~**F.** No traffic shall be generated by such home occupation in greater volumes than would normally be expected in a residential neighborhood, and any need of parking generated by the conduct of such home occupation shall be provided off the street and other than in a required front yard;

~~F.~~**G.** No equipment or process shall be used in such home occupation which creates noise, vibration, glare, fumes, odors, or electrical interference detectable to the normal senses off the lot. In the case of electrical interference, no equipment or process shall be used which creates visual or audible interference in any radio or television receivers off the premises, or causes fluctuations in line voltage off the premises.

H.The only retail sales allowed shall consist of the sale of commodities/products prepared on the premises in connection with such occupation or activity.

Horticultural services. Commercial services which are oriented to support the science or practical application of the cultivation of fruits, vegetables, flowers, and plants.

Junk Yard. An area of land with or without buildings used for, or occupied by, a deposit, collection, or the storage outside of a completely enclosed building, or used and/or discarded materials such as waste paper, rags or scrap metal, used building materials, home furnishings, machinery, vehicles, or parts thereof, with or without the dismantling, processing, salvage, sale, or other use or disposition of the same.

Kennel. Any premise or portion thereon where more than five (5) dogs, cats, or other household pets are bred, raised, trained, boarded, harbored, or kept for remuneration. Veterinary clinics, animal hospitals and animal shelters are specifically excluded.

Leaks and Spills. Any unplanned or improper discharge of a potential containment including any discharge of a hazardous material.

Light Manufacturing. Those manufacturing processes which are not obnoxious due to dust, odor, noise, vibration, pollution, smoke, heat or glare. These commercial and industrial uses are characterized by generally having all aspects of the process carried on within the building itself.

Lot. A lot is any lot, plot, or parcel of land under one ownership, occupied ~~by one principal building or united group of buildings~~, and the accessory building or buildings customarily incident to such principal building or buildings ~~to include all open spaces required by this regulation~~.**or intended for occupancy by a use permitted in this Ordinance including one**

(1) principal building together with its accessory buildings, open spaces and parking spaces required by this ordinance.

~~A. Lot Area. The lot area is the land in square feet within the lot line.~~

~~B. Lot Depth. The depth of a lot is the mean distance from the front side or road line of the lot to its rear line, measured in the general direction of the side lines of the lot.~~

~~C. Lot Width. The width of a lot is the mean distance between straight side lot lines measured at a point fifty (50) feet back from the front line thereof.~~

Lot Area. The lot area is the land in square feet or acres within the lot line.

Lot, Corner. A lot abutting upon two (2) or more streets at their intersection.

Lot, Depth of. The average horizontal distance between the front and rear lot lines.

Lot, Double Frontage. A lot having a frontage of two (2) streets as distinguished from a corner lot.

Lot of Record. A subdivision, the plat of which has been recorded in the office of the Register of Deeds, or a parcel of land the deed or agreement to convey to which was recorded in the office of the Register of Deeds. For the minimum lot area requirement (35 acres) not to apply in the "A" Agriculture Zoning District, such lot of record had to be recorded prior to October 26, 1976. For the minimum lot area requirement (10 acres) not to apply in the "C" Commercial Zoning District or "I" Industrial District, such lot of record had to be recorded prior to July 31, 2001. For the minimum lot area requirement (2 acres) not to apply in the "LP" Lake Park Zoning District, such lot of record had to be recorded prior to June 18, 1974.

Lot Width. The width of a lot is the mean distance between straight side lot lines measured at a point fifty (50) feet back from the front line thereof.

Manufactured ~~and Mobile~~ Home. **See Chapter 5.11**

~~A. For the purpose of this Regulation, manufactured homes and mobile homes will be regulated by types. Three types of homes are defined under these regulations.~~

~~1. Type A manufactured home shall:~~

~~a. Have more than 1,100 square feet of occupied space in a double-section or larger multi-section unit.~~

~~b. Must not be older than five years from the date of manufacture.~~

~~c. Utilize a permanent perimeter enclosure of metal, vinyl, wood or styrofoam in accordance with manufacturer's specifications.~~

~~d. Be anchored to the ground, in accordance with manufacturer's specifications, or as prescribed by the ANSI/NFPA 501A standards.~~

~~e. Have a gabled roof with a pitch of at least 2/12 feet.~~

f. Have siding material of a type customarily used on site-constructed residences.

g. Have roofing material of a type customarily used on site-constructed residences.

2. Type B manufactured home shall:

a. Have more than 700 square feet of occupied space in a single, double, expando or multi-section unit.

b. Utilize a permanent perimeter enclosure of metal, vinyl, wood or styrofoam in accordance with manufacturer's specifications.

c. Be anchored to the ground, in accordance with manufacturer's specifications, or as prescribed by the ANSI/NFPA 501A Standards.

d. Have siding material of a type customarily used on site-constructed residences.

e. Have roofing material of a type customarily used on site-constructed residences.

f. Be placed onto a support system, in accordance with approved installation standards, as specified in subsection (b), Installation Standards.

3. A Type C manufactured home shall:

a. Have more than 700 square feet of occupied space in a single, double, expando or multi-section unit.

b. Utilize a permanent perimeter enclosure of metal, vinyl, wood or styrofoam in accordance with manufacturer's specifications.

c. Be anchored to the ground, in accordance with manufacturer's specifications or as prescribed by the ANSI/NFPA 501A Standards.

d. Be placed onto a support system in accordance with approved installation standards, as specified in subsection (b), Installation Standards.

B. Installation Standards.

1. Support System.

a. All HUD-Code manufactured homes of the Type A classification shall be installed with load bearing foundations in conformance with the manufacturer's installation specifications.

b. Type B and C manufactured homes not placed on a permanent foundation shall be installed on a support system in conformance with the manufacturer's installation specifications or with the support systems regulations in the ANSI/NFPA 501A 1977 installation standards.

C. Nonconforming Homes.

~~A manufactured or mobile home placed and maintained on a tract of land and deemed to be a legal nonconforming use prior to the adoption of this Ordinance, shall continue to be a legal nonconforming use. If the nonconforming use is discontinued, the land thereafter must be used in conformity with all provisions of this Ordinance.~~

~~D. Replacement of Nonconforming Homes.~~

~~Thereafter, upon application to the Zoning Officer and subsequent approval thereof, a manufactured or mobile home, deemed a legal nonconforming use, may be replaced by a manufactured home, provided the replacement is of an equal or higher type. Equal or higher type means that a manufactured home may be replaced with a Type A, B or C manufactured home; a Type C manufactured home could be replaced with a Type A, B or C manufactured home; a Type B manufactured home could be replaced with a Type A or B manufactured home; a Type A manufactured home could be replaced with another Type A manufactured home.~~

~~E. Structural Alteration.~~

~~Due to its integral design, any structural alteration or modification of a manufactured or mobile home after it is placed on the site must be approved by the Zoning Officer.~~

Manufactured Home Park. ~~Any plot or plots of ground upon which one or more manufactured housing units, occupied for dwelling or sleeping purposes, can be or are intended to be located, regardless of whether or not a charge is made for such accommodations~~. **Any manufactured home court, camp, park, site, lot, parcel or tract of land intended for the purpose of supplying a location, or accommodations, for manufactured homes and upon which manufactured homes are parked and shall include all buildings used or intended for use as part of the equipment thereof whether a charge is made for the use of the manufactured home park and its facilities or not. "Manufactured Home Park" shall not include automobile or manufactured home sales lots on which unoccupied manufactured homes are parked for the purposes of inspection and sale.**

Manure Storage Area. An area for the containment of animal manure.

Mineral. An inanimate constituent of the earth in a solid, liquid or gaseous state which, when extracted from the earth, is useable in its natural form as a metal, a metallic compound, a chemical, an energy source, or a raw material for manufacturing or construction material. For the purpose of these regulations, this definition does not include surface or subsurface water, geothermal resources, or sand, gravel and quarry rock.

Mineral Extraction. The removal of a mineral from its natural occurrence on affected land. The term includes, but is not limited to, underground and surface mining.

Modular Home.

1. **Modular homes shall meet the following regulations.**

   a. **Modular homes shall meet or exceed Uniform Building Codes.**

   b. **Modular homes will include all off-site constructed homes, which may be transported to the site in one or more sections.**

c. Modular homes shall have more than one thousand (1,000) square feet in ranch style and 850 square feet split and be placed on a permanent foundation.

d. Modular homes shall not have attached running gear and a trailer hitch or the capacity to have attached running gear and trailer hitch.

e. Modular homes shall have a minimum of a 4/12-roof pitch.

f. Have siding material of a type customarily used on site-constructed residences.

g. Have roofing material of a type customarily used on site-constructed residences.

Motel/Hotel. A series of attached, semi-attached, or detached sleeping or living units, for the accommodation of transient guests and not customarily including individual cooking or kitchen facilities, said units having convenient access to off-street parking spaces for the exclusive use of guests or occupants.

Nonconforming Building or Structure or Use. ~~A non-conforming building or structure is a building or structure, the use of which, in whole or part, does not conform to the regulations of the District in which same is located.~~ Any building or use of land, land lawfully occupied by a use at the time of passage of this regulation or amendment thereto, which does not conform after the passage of this regulation or amendment.

~~**Non-Conforming Use**. A non-conforming use is a use in or of any building or structure which does not conform to the use regulations of the District in which such use exists.~~

Nonstandard Use. The category of nonconformance consisting of lots occupied by buildings or structures or uses which existed immediately prior to the effective date of this ordinance which fail to comply with any of the following: minimum lot requirements for the area, density, width, front yard, side yard, rear yard, height, unobstructed open space, or parking for the district in which they are located, even though the use of the premises conforms to the permitted uses within the district as set out in the provisions of this ordinance.

Outdoor Storage. The keeping, in an unroofed area, of any goods, junk, material, merchandise, or vehicles in the same place for more than twenty-four (24) hours.

Owner (when relating to Wireless Communication Towers). Means any Person with fee title or a long-term (exceeding ten (10) years) leasehold to any parcel of land within the County who desires to develop, or construct, build, modify, or erect a Tower upon such parcel of land.

Parking Space. An area, enclosed or unenclosed, sufficient in size to store one (1) automobile, together with a driveway connecting the parking space with a street or alley.

Parks and Recreation Areas. Public, non-commercial recreation facilities open to the general public an requiring minimal structural development, including, but not limited to playgrounds, parks, monuments, green strips, open space, mini-parks, athletic fields, boat launching ramps, piers and docks, picnic grounds, public campgrounds swimming pools, and wildlife and nature preserves, along with any necessary accessory facilities, rest rooms, bath houses, and the maintenance of such land and facilities, but not

including private, commercial campgrounds, commercial recreation and/or amusement centers.

Pasture. A field providing continuous forage to animals and where the concentration of animals is such that a vegetative cover is maintained during the growing season.

Permit. A permit required by these regulations unless stated otherwise.

Permitted Use. Any use allowed in a zoning district and subject to the restrictions applicable to that zoning district.

Plat. The maps, drawing, or chart on which a subdivider's plan of subdivision is legally recorded.

Potential Pollution Hazard. A concentrated animal feeding operation of **ten** (10) to **three hundred** (300) animal units may be classified as a Class 4 Operation by the County Zoning Officer when a potential pollution hazard exists. Factors to be considered by the Zoning Officer in determining a potential pollution hazard include the following:

A. The concentrated animal feeding operation does not meet the minimum setback and separation distances of these regulations.

B. A potential water pollution hazard exists due to siting over a shallow aquifer or drainage which contributes to the waters of the State.

Primary Containment Facility. A tank, pit, container, pipe or vessel of first containment of a liquid or chemical.

Principal Building. The structure in which the principal use of the lot is conducted. For Example a dwelling on a residential lot.

Principal Use. The primary use to which the premises are devoted.

~~**Private Dwellings**. A private dwelling is a detached building, designed for, or occupied exclusively by, one family.~~

~~**Private Garage**. A private garage is a garage with a capacity of not more than four (4) family cars and pickups for storage only.~~

Private Shooting Preserves. An acreage of at least one hundred and sixty (160) acres and not exceeding one thousand two hundred and eighty (1,280) acres either privately owned or leased on which hatchery raised game is released for the purpose of hunting, for a fee, over an extended season.

Private Wind Energy Conversion System (PWECS). Any mechanism or device, not owned by a public or private utility company, designed for the purpose of converting wind energy into electrical or mechanical power to be used on the site where said power is generated.

Process Generated Wastewater. Water directly or indirectly used in the operation of an animal feeding operation. The term includes spillage or overflow from watering systems; water and manure collected while washing, cleaning or flushing pens, barns, manure pits or other

areas; water and manure collected during direct contact swimming, washing or spray cooling of animals; and water used in dust control.

Process Wastewater. "Process wastewater" means any process generated wastewater and any precipitation (rain or snow) that comes into contact with the animals, manure, litter or bedding, feed, or other portions of the animal feeding operation. The term includes runoff from an open lot.

Quarter-Quarter Section. The Northeast, Northwest, Southwest, or Southeast quarter (1/4) of a quarter section delineated by the United States Public Land Survey or a government lot per such survey, if such lot contains a minimum of thirty-five (35) acres.

Range (Target/Shooting). Shall be defined as an area for the discharge of weapons for sport under controlled conditions where the object of the shooting is an inanimate object such as, but not limited to, paper, metal or wooden targets. A Range Officer shall be present on site at any Range when the range is in use. The term range includes archery ranges.

Range Officer. Means the person designated to be responsible at a Range at any given time during any activity.

~~**Rear Yard**. A yard across the whole width of a lot, extending from the rear line of the building to the rear line of the lot.~~

Religious Conference Facility. One or more buildings or structures whose primary purpose is to provide religious training/service and other associated activities. Such facilities may include but are not limited to recreational facilities; chapels/churches; incidental retail sales; food service; indoor and outdoor recreation – to include including therapeutic horse riding, group assembly, campgrounds; administrative offices; and on-site employee residences.

Religious Farming Community. A corporation formed primarily for religious purposes whose principle income is derived from agriculture and/or a farm which may or may not be held in collective ownership, in which multiple families reside on-site and use or conduct activities upon the property which are participated in, shared, or used in common by the members of the group residing thereon.

Resort. This category provides commercial hospitality lodgings in spacious settings that are principally intended for vacationing, relaxation and conference activities for visitors to the community.

Retail Sales and Trade. Establishments engaged in selling products, goods or merchandise to the general public for personal or household consumption; and establishments engaged in providing services or entertainment to the general public including eating and drinking establishments, hotels, motels, repair shops, indoor amusement, copying services, health, professional, educational, and social services, and other miscellaneous services.

Rubble Site. A site for the disposition of refuse as defined by the South Dakota Department of Environment and Natural Resources.

Sale or Auction Yard or Barn. A place or building where the normal activity is to sell or

exchange livestock. Livestock normally in yard or barn for one (1) day during sale or auction.

Sanitary Landfill. A government-owned site for the disposal of garbage and other refuse material.

Seasonal Camp Trailers or Recreational Vehicles. A vehicle designed for temporary seasonal living quarters.

Secondary Containment Facility. A second tank, catchment pit, pipe or vessel that limits and contains a liquid or chemical leaking or leaching from a primary containment area; monitoring and recovery systems are required.

Service Station, Automobile. Any building or premise which provides for the retail sale of gasoline, oil, tires, batteries, and accessories for motor vehicles and for certain motor vehicle services, including washings, tire changing, repair service, battery service, radiator service, lubrication, brake service, wheel service, and testing or adjusting of automotive parts. Automobile repair work may be done at a service station provided that no rebuilding of engines, spray paint operations, or body or fender repair is permitted. Gasoline pumps and gasoline pump islands shall be located more than twelve (12) feet from the nearest property line.

Setback. The setback of a building is the minimum horizontal distance between the street **or property** line and the front line of the building or any projection thereof, except cornices, unenclosed porches, and entrance vestibules and window bays projecting not more than three and one-half (3 1/2) feet from the building and having no more than fifty (50) square feet area and not extending above the first story of the building.

Setback Between Uses. Unless specifically mentioned within this ordinance, the setback or separation distance between uses is the minimum horizontal distance measured from the wall line of a neighboring principal building to the wall line of the proposed building/structure/use.

Shall means that the condition is an enforceable requirement of this regulation.

Shallow Aquifer. An aquifer vulnerable to contamination because the permeable material making up the aquifer (a) extends to the land surface so percolation water can easily transport contaminants from land surface to the aquifer, or (b) extends to near the land surface and lacks a sufficiently thick layer of impermeable material on the land or near the land surface to limit percolation water from transporting contaminants from the land surface to the aquifer.

Shallow Well. A well which is located in a shallow aquifer.

Shelterbelt. For the purposes of this ordinance a shelterbelt shall include ten (10) or more trees planted in a line, with each trees separated by a distance of forty (40) feet or less. Ornamental and/or shade trees, generally used in front yards and spaced further than thirteen (13) feet apart and further do extend lineally for a distance of over one hundred fifty (150) feet, are not considered shelterbelts.

Should. Means that the condition is a recommendation. If violations of this regulation occur, the County will evaluate whether the party implemented the recommendations contained in this regulation that may have helped the party to avoid the violation.

~~**Side Yard**. A yard between the building and the adjacent side line of the lot which separates it from another lot, extending from the front lot line to the rear yard.~~

Sign. Any device or structure, permanent or temporary, which directs attention to business, commodity, service or entertainment but excluding any flag, badge or insignia of any government agency, or any civic, charitable, religious, patriotic or similar organizations.

Sign, Abandoned. A sign or sign structure which contains no sign copy, contains obliterated or obsolete sign copy, or is maintained in an unsafe or unsightly condition for a period of three (3) months shall be considered an abandoned sign.

Sign Area: The total area or areas of all signs within the outer edges of the sign or advertising message. Sign area may be calculated in the following manners:

A. A single message on a single sign face.

B. Multiple messages on a single sign face:

C. (Adjacent to I-29 only) Multiple messages on stacked signs:

Sign. Off-premises. Any sign identifying or advertising a business, person, activity, goods, products or services at a location other than where such sign has been erected.

Sign, On-premises. Any sign identifying or advertising a business, person, activity, goods, products or services located on the premises where the sign has been erected.

Sign Structure. Any structure which supports, has supported, or is capable of supporting a sign, including decorative cover.

Significant Contributor of Pollution. To determine if a concentrated animal feeding operation meets this definition, the following factors are considered:

1. Size of feeding operation and amount of manure reaching waters of the state.

2. Location of the feeding operation in relation to waters of the state.

3. Means of conveyance of manure and process wastewater into waters of the state; and

4. The slope, vegetation, rainfall and other factors affecting the likelihood or frequency of discharge of animal wastes and process wastewater into waters of the state.

Sleeping Quarters. A room or an area contained within a dwelling unit utilized for the purpose of sleep.

Solution mining. The mining of an ore body with circulation of chemicals through injection and recovery wells. Solution Mining for minerals is prohibited.

~~**Special Exception.** A use that would not be appropriate generally or without restriction throughout the zoning district. The use may be appropriate in a zoning district specific standards and/or conditions are applied. The Board of Adjustment may permit such uses when specific provision is made in the zoning district regulations.~~

Specified Anatomical Areas. Means (1) Less than completely and opaquely covered human or animal genitals, pubic region, or pubic hair, buttocks; and female breasts below a point immediately above the top of the areola; and (2) Genitals of humans or animals in a discernible turgid state, even if completely or opaquely covered.

Specified Sexual Activities. Means (1) Human genitals in a state of sexual stimulation or arousal; (2) Acts or representations of acts of human or animal masturbation, sexual intercourse or sodomy, bestiality, oral copulation or flagellation; (3) Fondling or erotic touching of human or animal genitals, pubic region, buttock or female breast; and (4) Excretory functions as part of or in connection with any activities set forth in an Adult Bookstore or "Adult Entertainment Cabaret".

Stable. A building for the shelter and feeding of domestic animals, especially horses and cattle.

Stable, Commercial. A building for the shelter and feeding of domestic animals, especially horses and cattle where such domestic animals are raised, trained, boarded, harbored, or kept for remuneration. Veterinary clinics, animal hospitals and animal shelters are specifically excluded.

Stacked Signs: Two or more signs stacked vertically on a single sign structure.

Stealth. Means any Tower or Telecommunications Facility which is designed to enhance compatibility with adjacent land uses, including, but not limited to, architecturally screened roof-mounted antennas, antennas integrated into architectural elements, and Towers designed to look other than like a Tower such as light poles, power poles, and trees. The term Stealth does not necessarily exclude the use of uncamouflaged lattice, guyed, or monopole Tower designs.

Street, Highway or Road. ~~The term street shall include and apply to any public way except alleys.~~ **All property acquired or dedicated to the public and accepted by the appropriate governmental agency for street, highway or road purposes.**

A. **Street, Arterial.** A street designated as such on the **Major** ~~Official Road~~/Street Plan of the Comprehensive Plan of Codington County, South Dakota.

B. **Street, Collector.** A street designated as such upon the **Major** ~~Official Road~~/Street Plan of the Comprehensive Plan of Codington County, South Dakota.

C. **Street,** ~~Miner~~ **Local**. Any street which is not an arterial street or collector street.

~~**Street Line**. The street line is the dividing line between the street or road and the lot.~~**Street, Highway or Road Right-of-Way (ROW) Line. A dividing line between a lot or parcel of land and a contiguous street, highway or road.**

Structure. Anything constructed or erected, the use of which requires permanent location on the ground or attached to something having a permanent location on or below the ground.

Structure, Temporary. Anything constructed or erected, or placed, the use of which requires temporary location on the ground or attached to something having a temporary location on or below the ground.

Substantial improvement. Means any repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds fifty (50) percent of the market value of the structure either:

1. Before the improvement or repair is started, or

2. If the structure has been damaged and is being restored, before the damage occurred. For the purpose of this designation, "substantial improvement" is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure.

The term does not, however, include either:

a. Any project for improvement of a structure to comply with existing State or local health, sanitary, or safety code specifications which are solely necessary to assure safe living conditions, or

b. Any alteration of a structure listed on the National Register of Historic Places or a State Inventory of Historic Places.

Telecommunications Facilities. Means any cables, wires, lines, wave guides, antennas, and any other equipment or facilities associated with the transmission or reception of communications which a Person seeks to locate or has installed upon or near a Tower or Antenna Support Structure. However, Telecommunications Facilities shall not include:

1. Any satellite earth station antenna two (2) meters in diameter or less which is located in an area zoned industrial or commercial; or

2. Any satellite earth station antenna one (1) meter or less in diameter, regardless of zoning category.

Temporary Fireworks Sales Stand. A structure utilized for the licensed resale of fireworks during the time period allowed by South Dakota State Law.

Ten Year Time of Travel Distance. The distance that ground water will travel in ten years. This distance is a function of aquifer permeability and water table slope.

Tower. Means a self-supporting lattice, guyed, or monopole structure constructed from grade which supports Telecommunications Facilities. The term Tower shall not include amateur radio operators' equipment, as licensed by the FCC.

Tree, Ornamental. A deciduous tree which is typically grown because of its shape, flowering characteristics, or other attractive features, and which grows to a mature height of about twenty-five (25) feet or less.

Tree, Shade. For the purposes of this Ordinance, a shade tree is a deciduous tree which is has a mature crown spread of fifteen (15) feet or greater, and having a trunk with at least five (5) feet of clear stem at maturity.

Twin Homes. A two-family dwelling which has a common wall and is platted into two (2) separate lots.

Variance. A variance is a relaxation of the terms of the zoning ordinance where such variance will not be contrary to the public interest and where, owing to conditions peculiar to the property and not the result of the actions of the applicant, a literal enforcement of the ordinance would result in unnecessary and undue hardship. As used in this ordinance, a variance is authorized only for height, area, and size of structure or size of yards and open spaces; establishment or expansion of a use otherwise prohibited shall not be allowed by variance, nor shall a variance be granted because of the presence of nonconforming in the zoning district or uses in an adjoining zoning district.

Waters of the State. Means all waters within the jurisdiction of this state, including all streams, lakes, ponds, impounding reservoirs, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private, situated wholly or partly within or bordering upon the state.

Yard. An open space on the same lot with a building or group of buildings, which open space lies between the building or group of buildings and the nearest lot line. **In measuring a yard for**

the purpose of determining the width of a side yard, the depth of a front yard, or the depth of a rear yard, the minimum horizontal distance between the lot line and bearing wall of the main building shall be used.

Yard, Front. A yard extending across the front of a lot between the sideyard lines, and being the minimum horizontal distance between the road right-of-way line and the main bearing wall of the main building or any projections thereof other than the projections of the usual steps, unenclosed balconies or open porch.

Yard, Rear. A yard across the whole width of a lot, extending from the rear line of the building to the rear line of the lot.

Yard, Side. A yard between the building and the adjacent side line of the lot which separates it from another lot, extending from the front lot line to the rear yard.

Zoning Officer. The individual(s) appointed by the Board of County Commissioners and designated to administer and enforce the zoning ordinance.

Zone of Contribution. The entire area around a well or well field that contributes water to the well or wellfield.

~~SECTION~~ARTICLE III
~~ESTABLISHMENT OF ZONING~~ DISTRICT REGULATIONS

~~3.1 For the purpose of this Regulation, the unincorporated area of Codington County is hereby divided into the following zoning districts.~~

~~3.2 There may be one or more districts of each class and, where more than one district of a class exists, such districts may be entirely separate and distant from other districts of the same class.~~

~~3.3 No building or any part thereof shall be erected, constructed, reconstructed, converted, altered, enlarged, extended, raised, moved or used, and no premises shall be used for any purpose other than a purpose permitted in the District in which said building or premise is located, except as hereinafter provided.~~

~~3.4 For the purpose of this Regulation, the unincorporated area of the County is divided into zoning districts and said district boundaries are hereby established as indicated upon a map entitled "Official Zoning Use Districts, Codington County," said map being on file in the office of the County Planning Commission and the office of the County Auditor.~~

CHAPTER 3.01. APPLICATION OF DISTRICT REGULATIONS.

Section 3.01.01. Application of District Regulations.

The regulations set by this Ordinance within each District shall be minimum regulations and shall apply uniformly to each class or kind of structure of land, and particularly, except as hereinafter provided:

1. **No structure, permanent or temporary, shall be erected, converted, enlarged, reconstructed or structurally altered to exceed the height limit, area and parking requirements of the district in which the building is located. Further, no building or use of land shall be used except for a purpose permitted in the district in which the building or land is located.**

CHAPTER 3.02. NONCONFORMING USES.

Section 3.02.01. Purpose and Intent. The purpose of this article is to provide for the regulation of nonconforming uses, buildings, and structures, and to specify those circumstances under which they shall be permitted to continue. Further, it is intent of this Ordinance to permit these nonconformities to continue until they are removed, but not to encourage their survival.

Section 3.02.02. Continuation of Nonconforming Uses. Subject to the provisions of this article, the lawful use of a premise existing immediately prior to the effective date of this ordinance may be continued although such use does not conform to the provisions hereof.

Section 3.02.03. Use Becoming Nonconforming by Change in Law or Boundaries. Whenever the use of a premises becomes a nonconforming use through a change in zoning ordinance or district boundaries, such use may be continued, although the use does not conform to the provisions thereof.

Section 3.02.04. Extension or Enlargement. A nonconforming use shall not be enlarged, extended, converted, reconstructed, or structurally altered unless such use is changed to a use permitted in the district in which the premise is located.

Section 3.02.05. Restoration After Damage. When the use of a building is nonconforming as defined by this ordinance and such a building is damaged by a fire, explosion, act of God, or the public enemy to the extent of more than sixty (60) percent of its fair market value, it shall not be restored except in conformity with the provisions of the district in which the building is located.

Section 3.02.06. Repairs and Maintenance. On any nonconforming structure or portion of a structure containing a nonconforming use, work may be done on ordinary repairs, or on repairs or replacement of non-bearing walls, fixtures, wiring, or plumbing, provided that the nonconformity of the structure shall not be increased.

Section 3.02.07. Unsafe Nonconforming Use. If a nonconforming structure or portion of a structure containing a nonconforming use becomes physically unsafe or unlawful due to lack of repairs and maintenance, and is declared by any duly authorized official to be unsafe, or unlawful by reason of physical condition, it shall not thereafter be restored, repaired, or rebuilt except in conformity with the regulations of the district in which it is located.

Section 3.02.08. Discontinuance of Nonconforming Use. In the event that a nonconforming use is discontinued for more than one (1) year, any subsequent use shall thereafter be in conformity with the regulations of the district in which it is located.

Section 3.02.09. Effect on Use Which is Illegal Under Prior Law. Nothing in this ordinance shall be interpreted as authorization for, or approval of, the continuance of the use of a premises in violation of zoning regulations in effect immediately prior to the effective date of this ordinance.

Section 3.02.10. Powers of the Planning Commission/Board of Adjustment. Nothing contained in this Section shall be so construed as to abridge or curtail the powers of the County Planning Commission or Board of Adjustment as set forth elsewhere in this Ordinance.

Section 3.02.11. Continuation of Nonstandard Uses. Nonstandard uses existing immediately prior to the effective date of this ordinance may be continued, although such uses do not conform to the provisions hereof. Nonstandard buildings or structures may be enlarged or extended, converted, reconstructed, or structurally altered as follows:

1. **Enlargements, extensions, conversions, or structural alterations may be made as required by law or ordinance.**

2. **Structural alteration of buildings or structures may otherwise be made if such changes do not encroach into an existing front yard, side yard, or rear yard which is less than the minimum required yards for the district in which they are located.**

3. Enlargement, extension, conversion of buildings or structures may otherwise be made if such changes comply with the minimum required yards, lot area, height, landscaping, parking, and density for the district in which they are located.

Section 3.02.12. Nonconforming Lots of Record.

1. In any district in which single-family dwellings are permitted, a single-family dwelling and customary accessory buildings may be erected on any single lot of record at the effective date of adoption or amendment of this Ordinance, notwithstanding limitations imposed by other provisions of this Ordinance. Such lot must be in separate ownership and not of continuous frontage with other lots in the same ownership. This provision shall apply even though such lot fails to meet the requirements for area or width, or both, that are generally applicable in the district, provided that yard dimensions and requirements other than those applying to area or width, or both, of the lot shall conform to the regulations for the district in which such lot is located. Variance of yard requirements shall be obtained only through action of the Board of Adjustment.

2. If two (2) or more lots or combinations of lots and portions of lots with continuous frontage in single ownership are of record at the time of passage or amendment of this Ordinance, and if all or part of the lots do not meet the requirements established for lot width and area, the lands involved shall be considered to be an undivided parcel for the purposes of this Ordinance, and no portion of said parcel shall be used or sold in a manner which diminishes compliance with lot width and area requirements established by this Ordinance, nor shall any division of any parcel be made which creates a lot width or area below the requirements stated in this Ordinance.

3. Any area proposed or being developed for residential use in the "A" Agricultural Land District must provide for a minimum of thirty-five (35) acres per lot, unless platted prior to the adoption of Codington County Resolution 1167 (Adopted October 26, 1976). Exception to the lot size may be made according to Codington County Zoning Ordinance Section 3.04.03.

CHAPTER 3.03. ZONING DISTRICTS.

Section 3.03.01. Districts.

1. For the purpose of this Ordinance, the unincorporated areas of the County may be divided into any of the following zoning districts: A-Agricultural; C-Commercial; I-Industrial; LP-Lake Park; NR-Natural Resource; PR-Planned Residential; ~~and~~ TD-Town District and RR-Rural Residential District. In addition to zoning districts, the FP-Flood Protection and AP-Aquifer Protection zoning overlay districts impose special regulations on the property that may fall within these districts without abrogating the requirements imposed by the underlying land use district regulations.

2. The requirements as set forth below for each of the use districts listed as part of this Ordinance shall govern the development within the said districts as outlined on the map entitled "Official Zoning Map, Codington County, South Dakota~~.~~;" and "Official Map of the Rural Residential District."

3. "A" AGRICULTURAL LAND DISTRICT - ~~Agricultural Land District is primarily for the preservation of open space, and land currently used for intensive agriculture and considered not to be yet ready for further development~~. **This district is established to preserve open space and maintain and promote farming and related activities within an environment which is generally free of other land use activities. Residential development will be discouraged to minimize conflicts with farming activities and reduce the demand for expanded public services and facilities.**

4. "AP" AQUIFER PROTECTION OVERLAY DISTRICT - The purpose of the Aquifer Protection Overlay District is to protect public health and safety by minimizing contamination of the shallow aquifers of Codington County.

5. "C~~-2~~" ~~LOCAL~~ COMMERCIAL DISTRICT - The ~~Local~~ Commercial District is intended to provide areas for commercial activities oriented primarily to, and supportive of, farming and other activities which are determined to be appropriate in the rural area.

6. "FP" FLOOD ~~PRONE~~ **PROTECTION OVERLAY** DISTRICT - The Flood ~~Prone~~ **Protection Overlay** District is established to protect the natural environment and resources from destructive land uses and to protect lives and property along and adjacent to streams and rivers.

~~"I-1" LIGHT INDUSTRIAL DISTRICT~~

~~Light Industrial District for warehousing and light manufacturing.~~

~~"I-2" HEAVY INDUSTRIAL DISTRICT~~

~~Heavy Industrial District of all types of manufacturing which produces smoke, noise, dust, odor, and/or heavy traffic; also for storage areas for inflammable or otherwise dangerous materials.~~

7. "I" INDUSTRIAL DISTRICT - The Industrial District is established primarily for warehousing and light manufacturing. Heavy industrial uses such as manufacturing which produces smoke, noise, dust, odor, and/or heavy traffic; also for storage areas for inflammable or otherwise dangerous materials shall require special review and consideration.

8. "LP" LAKE-PARK DISTRICT - Lake Park District is to provide for orderly low residential and recreational development, together with certain public facilities, customary home occupations, and certain commercial establishments, along lakeshores.

9. "NR" NATURAL RESOURCE DISTRICT - The Natural Resource District is to provide for the retaining of natural vegetation of a particular area, to preserve the natural environment and resources from destructive land uses, and to protect wildlife habitat. Such areas may include, but are not limited to, flood plains of rivers, streams, and lakes, abandoned quarries, certain wetlands and natural prairies, and historical sites.

10. "PR" PLANNED RESIDENTIAL DISTRICT - The Planned Residential District is to provide for residential subdivisions which, through their design and development, will limit the amount of agricultural land that is taken out of production, will not require excessive public expenditures for roads or other improvements and services, and which will minimize the conflict between farm and non-farm uses.

11. "TD" TOWN DISTRICT - The Town District is established to provide for orderly low density residential development, together with certain public facilities, and commercial/industrial uses which are not detrimental in the unincorporated towns of Codington County.

12. "RR" RURAL RESIDENTIAL DISTRICT DISTRICT – See Section 3.13.01.

Section 3.03.02. Prohibited Uses.

All uses and structures not specifically listed as a permitted use or as a conditional use in a particular zoning district or overlay district shall be prohibited in said district.

~~**SECTION IV**~~
~~**DISTRICT REQUIREMENTS**~~

~~The requirements as set forth below for each of the use districts listed as part of this Regulation in Section III shall govern the development within the said districts as outlined on the map entitled "Zoning Use Districts, Codington County, South Dakota."~~

CHAPTER ~~4.1~~ ~~3~~.04. "A" AGRICULTURAL LAND DISTRICT.

Section 3.04.01. Permitted Uses.

1. ~~Animal husbandry service~~ **Agricultural activities and farm related buildings, including Type 5 Concentrated Animal Feeding Operations.**

2. ~~Field crops and grasslands~~ **One (1) single-family non-farm dwelling, including site-built homes, modular homes, and Type A manufactured homes for each quarter-quarter section not already containing a farm dwelling or a non-farm dwelling.**

3. ~~Fisheries services~~ **Farm dwellings and farm buildings.**

4. **Fisheries services and** Game propagation areas.

5. ~~Government grain storage sites~~ **Public park and recreation areas.**

6. ~~Horticultural services~~ **Field crops and grasslands.**

7. ~~Institution farms~~ **On-premise signs.**

8. ~~Farm dwellings and farm buildings~~ **Accessory uses and buildings.**

9. Orchards and tree farms.

10. Publ~~ic parks and recreation areas~~ **Temporary roadside stands for sales of agricultural products grown or produced on the premises.**

11. ~~Truck gardening~~ **Home occupation.**

12. Botanical gardens (nurseries and greenhouses) **– without retail sales.**

13. ~~One single-family, non-farm dwelling, including Type A manufactured home, for each quarter-quarter section not already containing a farm dwelling or a non-farm dwelling~~ **Stables**.

14. ~~Veterinarians offices and animal hospitals~~ **Private Wind Energy Conversion System (PWECs)**.

~~15. Schools;~~

~~16. Home occupations; and~~

~~17. Class 5 concentrated animal feeding operations.~~

~~18.Accessory Uses and buildings~~

Section 3.04.02. Conditional Uses.

~~B. The following are uses which may be permitted by a special exception permit issued by the Board of Adjustment. The permit may contain conditions and standards set forth within this ordinance and/or attached by the Board of Adjustment.~~

1. Airports and airstrips.

2. **Churches and** Cemeteries.

3. Commercial public entertainment enterprises not normally accommodated in commercial areas including, but not limited to, the following: music concerts, rodeos, tractor pulls, and animal and vehicle races.

4. ~~Extractive or mining and storage of these materials~~ **Sand, gravel or quarry operation; mineral exploration and extraction; rock crushers; and concrete and asphalt mixing plants provided:**

~~a. A requirement for receiving a permit for extractive/mining operations shall include a haul-road agreement between the applicant and appropriate governmental entity (Federal, State, County, Township, or Municipality).~~

a. The site meets the requirements of the State Department of Environment and Natural Resources.

b. A site plan is provided indicating the following information:

i. Present topography, soil types, and depth to groundwater.

ii. Location of existing water drainage, existing buildings, existing shelterbelts.

iii. Identification of roads leading to the site.

iv. Proposed changes at the site such as new shelterbelts, new buildings, changes in topography, new fence lines.

v. Proposed monitoring wells, etc.

vi. A requirement for receiving a permit for extractive/mining operations shall include a haul-road agreement between the applicant and appropriate governmental entity (Federal, State, County, Township, or Municipality).

vii. The applicant may be required to provide information regarding how potential air, noise, and water pollution would be minimized.

viii. The applicant shall provide for a plan for land reclamation of the land after mining is completed. Measures to be taken for surface reclamation shall take into account the impact on adjacent land uses and natural resources, and the proposed future use of the lands mined and adjacent lands. The reclamation plan shall include:

a. A reclamation schedule.

b. Methods of plugging drill holes.

b. Methods of severing and returning topsoil and subsoil.

c. Methods of grading, backfilling and contouring of exploration sites, access roads, and mining sites.

d. Methods of waste management and disposal, including liquid and solid wastes.

e. Method of revegetation.

ix. The applicant may be required to post a surety performance bond in an amount to be determined by the County Commission to assure that sufficient funds will be available to carry out required reclamation and, if necessary, decontamination of affected ground and surface waters. The amount shall be set by the County Commission based on an estimate of the cost of reclamation and decontamination. The bond shall be released five (5) years after mining and milling has ceased unless the Commissioners find, for good cause shown, that the water quality of the affected area has not been restored or the reclamation plan has not been completed. The amount of the surety bond may be reduced by the Commissioners if a bond is held by the State of South Dakota for the same purpose, by the same amount of the latter bond.

x. Sand, gravel or quarry operation; Mineral exploration and extraction operations; rock crushers; and concrete/ asphalt mixing plants will not be allowed within one thousand (1,000) feet of a residence. The setback will be measured from the mineral exploration and extraction operations; rock crushers; and/or concrete and asphalt mixing plant's property line to the nearest residence. The exception to this standard would apply to residences owned and lived in by the operator of the mineral exploration and extraction operations; rock crushers, and/or concrete/asphalt mixing plants.

xi. Sand, gravel or quarry operation; Mineral exploration and extraction; rock crushers; and/or concrete and asphalt mixing plants shall be set back at least sixty-five (65) feet from any public right-of-way.

5. Private club.

6. ~~Sanitary landfill dumping grounds but not within 160 rods of a residence or commercial establishment~~; **Sanitary landfills provided:**

   a. The site meets the requirements of the State Department of Environment and Natural Resources.

   b. A site plan is provided indicating the following information:

      i. Present topography, soil types, and depth to groundwater.

      ii. Location of existing water drainage, existing buildings, existing shelterbelts.

      iii. Identification of roads leading to the site.

      iv. Proposed changes at the site such as new shelterbelts, new buildings, changes in topography, new fence lines.

      v. Proposed monitoring wells, etc.

      vi. No sanitary landfill will be allowed within two thousand six hundred forty (2,640) feet from the landfill property line to the nearest residence or commercial use; excluding: the residence of the landfill operator.

7. ~~Sewage treatment plants, but not within 80 rods of a residence~~ **Domestic sanitary sewer treatment plant/facility.**

   a. The site meets the requirements of the State Department of Environment and Natural Resources.

   b. A site plan is provided indicating the following information:

      i. Present topography, soil types, and depth to groundwater.

      ii. Location of existing water drainage, existing buildings, existing shelterbelts.

      iii. Identification of roads leading to the site.

      iv. Proposed changes at the site such as new shelterbelts, new buildings, changes in topography, new fence lines.

      v. Proposed monitoring wells, etc.

      vi. No sewage treatment plant/facility will be allowed within one thousand three hundred twenty (1,320) feet from the sewage treatment plant/facility property line to the nearest residence; excluding: the residence of the landfill operator.

8. Class 1, Class 2, Class 3, and Class 4 concentrated animal feeding operations. See Concentrated Animal Feeding Operation, Section 5.~~21~~**14**.

9. **Commercial** Stables.

10. **Junkyards/salvage yards, provided that they meet the following minimum requirements and other restrictions that the Board of Adjustment may deem appropriate:**

    a. Junkyards/salvage yards shall be set back a minimum of one thousand three hundred twenty feet (1,320) feet from any adjoining road right-of-way.

    b. No junkyards will be allowed within three hundred thirty (330) feet from any adjoining property line.

    c. Junkyards shall be screened on all sides by a solid wall, with construction materials and design to be approved by the Board of Adjustment, at least two (2) feet above the highest stock pile or by a shelterbelt of shrubs and trees as approved by the Board of Adjustment; screening must be maintained in good repair.

    d. No junkyards will be allowed within one thousand (1,000) feet from the junkyard property line to the nearest residence; excluding: the residence of the junkyard operator.

    e. All junkyards must have a minimum lot area of ten (10) acres.

11. Public utility and public service structure including transmission lines, substations, gas regulator stations, pipelines, community equipment buildings, pumping stations, and reservoirs.

12. Land application of petroleum-contaminated soils.

11. Institution farms, including religious farming communities.

14. Bed and breakfast ~~home~~.

15. Wireless Telecommunications Towers and Facilities.

16. Extended home occupation (See Section 5.1~~3~~**2**).

17. Type B manufactured home not connected to an existing farmstead.

18. ~~Commercial hunting business~~ **Game Lodge**.

19. Group Homes.

20. ~~Dog~~ Kennels.

21. Wind Energy System (WES). (See Section 5.~~15~~**22**).

22. Public or private motorcycle recreation facilities.

23. **Target/Shooting Range.**

24. Veterinarians offices and animal hospitals.

25. **Golf course, golf driving range, clubhouse.**

26. **Seasonal retail stands – including produce and fireworks - utilizing a permanent structure.**

27. **Livestock sales barns.**

28. **Fur farms.**

29. **Rubble sites, composting sites, waste tire sites, restricted use sites, and other sites governed by the South Dakota Department of Environment and Natural Resources permits for solid waste.**

30. **Government grain storage sites.**

31. **Horticultural services.**

32. **Orchards and tree farms with retail sales.**

33. **Truck gardening.**

34. **Botanical gardens (nurseries and greenhouses) with retail sales.**

35. **Schools.**

36. **Private shooting preserve.**

37. **Temporary roadside stands not utilizing a permanent structure for sales of fireworks.**

38. **Religious Conference Facility.**

39. **Storage of Fireworks in temporary structures.**

40. **Public building or facilities erected or established and operated by any governmental agency.**

41. **Single family dwelling (farm or non-farm) constructed less than one-half (1/2) mile from an existing concentrated animal feeding operation. See Chapter 5.29**

Section 3.04.03 Area Regulations/Easement/Waivers

~~C. Area Regulations~~

All buildings shall be set back from street right-of-way lines and lot lines to comply with the following yard requirements:

1. Lot Size: All **eligible building** lots for **permitted uses** shall be a minimum of thirty-five (35) acres, except as provided in 7.a and 7.b of this Section. ~~Special exception uses shall have minimum area regulations determined by the Board of Adjustment~~

2. Lot Width: The lot width shall be a minimum of thirteen hundred (1,300) feet.

EXCEPTION: A residential dwelling may have a minimum lot width of six hundred fifty (650) feet if the depth of the lot is at least two thousand three hundred and forty-five (2,345) feet. This exception shall require Board of Adjustment approval.

3. Front Yard: The minimum depth of the front yard shall be sixty-five (65) feet and in no case shall an accessory building be located or extend into the front yard. In the case of a corner lot, front yards shall be provided on both streets.

4. **Conditional uses shall have minimum lot area and setback regulations determined by the Board of Adjustment.**

   a. EXCEPTION**S**:

      i. A structure with the floor space of less than two hundred (200) square feet **shall have a** front yard minimum depth **of** ~~shall be~~ one hundred sixty-five (165) feet.

      ii. Existing nonconforming residential structures, constructed prior to January 1, 2006, on a lot of record or on a lot containing at least thirty-five (35) acres although considered nonconforming, are eligible to be expanded or added onto, without Board of Adjustment Approval, as long as the existing front, side or rear yard setback(s) is not further encroached upon.

4. Side Yard: The minimum width of a side yard shall be twenty-five (25) feet.

5. Rear Yard: The minimum depth of a rear yard shall be twenty-five (25) feet.

6. Maximum Lot Coverage: Dwellings and buildings accessory thereto shall cover not more than twenty-five (25) percent of the lot area.

7. The Board of Adjustment may allow a smaller minimum lot requirement for the "A" Agricultural District under the following conditions:

   a. Where a permit for a**n additional** single-family ~~home~~ **farm dwelling** is requested on an existing farmstead, ~~so long as it is immediately connected to the existing farming operation~~ **provided**:

      1. The dwelling is located on the same legal description as the existing farmstead.

      2. The maximum number of dwelling units within the existing farmstead will not exceed two (2).

      3. The dwelling is occupied by employees or relatives of the farm owner.

      4. The additional single-family farm dwelling shall be removed in the event the structure becomes a non-farm dwelling.

   b. Where an existing farmstead is to be divided from adjacent farmland into a single separate parcel of five (5) acres or more.

~~8. Storage for junk yards shall be set back a minimum of eighty (80) rods from any adjoining road right-of-way and twenty (20) rods from any adjoining property line, and shall be~~

~~screened by a solid wall at least two (2) feet above the highest stock pile and maintained in a state of good repair. Further provided, that no storage yard for junk shall be allowed on any lot which is within sixty (60) rods from any residences other than that of the owner of the land.~~

~~D~~**8.** Height Regulations:

No principal building shall exceed two and one-half (2 1/2) stories or thirty-five (35) feet in height. Exceptions include the following structures:

1. Agricultural buildings.
2. Chimneys, smokestacks, cooling towers.
3. Radio and TV towers.
4. Water tanks.
5. Others, **as determined by the Board of Adjustment**, providing that they are not used for human occupancy.
6. Wind Energy System (WES).
7. Wireless Telecommunications Towers and Facilities.

~~E~~**9.** Agriculture Easement~~/Waiver~~

a. All new residential development (farm and non-farm) shall be required to file an "Agricultural Easement" **with the Register of Deeds** before the issuance of a building permit. **(See Chapter 5.27)**

~~**b. Applicants for residential development (farm and non-farm) are required to obtain a written waiver from the owner/operator of any existing concentrated animal feeding operation which is closer than one-half (1/2) mile from the proposed residential building site. If the applicant is unable to obtain the written waiver, he/she shall be required to file a waiver with the Register of Deeds waiving any or all common law challenges to future expansions of the said existing concentrated animal feeding operation. The waiver is to be filed with the Register of Deeds. (See Chapter 5.29)**~~

10. Access

a. The drive-way serving the parcel shall be separated from adjacent driveways on the same side of the road by the following distances depending upon road types:

i. Local road: 100 feet.

ii. Collector road: 300 feet.

iii. Arterial road: 500 feet.

iv. Minimum distance from intersection of two (2) or more of the above: 100 feet.

b. For all proposed uses and structures adjacent to a State highway, an access permit from the State of South Dakota Department of Transportation shall be required prior to the filing of a plat or the issuance of a building/use permit

CHAPTER ~~4.2~~ 3.05 "C~~-2~~" COMMERCIAL DISTRICT.

Section 3.05.01. Permitted Uses.

~~A. Uses Permitted~~

1. ~~Permitted uses in the A-Agricultural District except residential dwellings~~. **Field crops and grasslands**.

2. On~~/Off~~ **premise** signs.

3. Accessory uses and buildings.

4. Orchards and tree farms.

5. Temporary roadside stands for sales of agricultural products grown or produced on the premises.

Section 3.05.02. Conditional Uses.

~~B. Uses Permitted by Special Exception~~

1. ~~Abattoirs~~ **Wholesale warehouse and distributing**.

2. Welding and machine shops.

3. Gas, ~~and~~ oil, **liquid propane and liquid hydrogen** stations including bulk stations.

4. Public and private utilities.

5. Livestock sales.

6. Contractors' shops and yards including offices when in conjunction with a shop or yard.

7. ~~Other activities which are in general character of permitted uses in the "C-2" District~~ **Government-owned highway and street maintenance shops.**

8. Implement sales and service.

9. Truck terminals and freight warehouses.

10. Seed sales and grain storage, **fertilizer and chemical storage and sales**.

11. Recreation **vehicle sales and** park.

12. Bar/Tavern.

13. Commercial stables.

14. Kennel with or without animal grooming.

15. Veterinary clinics.

16. Wireless telecommunication towers and facilities.

17. Convenience store/service station.

18. Seasonal retail stands utilizing a structure (temporary or permanent).

19. Commercial orchards, tree farms, truck gardening, and greenhouses – with retail sales.

20. Motel/hotel.

21. Off-premise Signs.

22. Light manufacturing.

23. Commercial animal husbandry service.

24. Manufactured Home Park existing prior to June 18, 1974.

Section 3.05.03. Area Regulations.

~~C. Building Height Limits~~

~~1. No building shall exceed four (4) stories or fifty (50) feet in height.~~

~~2. Structures used for signs or other advertising purposes may not exceed one hundred twenty (120) feet in height.~~

~~D. Lot Requirements~~

~~1. Each lot shall contain a minimum of ten (10) acres and shall provide off-street parking at a ratio of three (3) square feet of parking area for each square foot of building area used as retail sales area; provided there shall be a minimum of 1,500 square feet of space for off-street parking.~~

~~2. Each lot which fronts on or has a side lot abutting any road shall have a building setback of at least one hundred (100) feet from said front or abutting lot line.~~

1. Lot Size. Each lot shall contain a minimum of ten (10) acres and shall provide off-street parking at a ratio of three (3) square feet of parking area for each square foot of building area used as retail sales area; provided there shall be a minimum of fifteen hundred (1,500) square feet of space for off-street parking.

2. Front Yard: The minimum depth of the front yard shall be one hundred (100) feet and in no case shall an accessory building be located or extend into the front yard. In the case of a corner lot, front yards shall be provided on both streets. Exception: The minimum front yard setback for off-premise signs, where the face of the sign is perpendicular to the Interstate 29 right-of-way, shall be ten (10) feet.

3. Building Height. No building shall exceed four (4) stories or fifty (50) feet in height.

4. Side and Rear Yard: The minimum side yard and rear yards shall be fifty (50) feet.

5. Access. For all proposed uses and structures adjacent to a State highway, an access permit from the State of South Dakota Department of Transportation shall be required prior to the filing of a plat or the issuance of a building/use permit.

6. Storage. All outdoor storage within five hundred (500) feet of a residential dwelling must be completely enclosed in a building or by a solid walled fence at least two (2) feet above the highest point of the stock pile which fence shall be maintained in safe and good repair. The County may require hard surfacing of parking lots.

4.3 I-1" LIGHT INDUSTRIAL DISTRICT

A. Uses Permitted

1. Agricultural uses as outlined under Agricultural Districts except residential dwellings;

2. On/Off site signs

B. Uses Permitted by Special Exception

1. The Board of Adjustment may permit other uses which, in its opinion, are not detrimental to other uses and are in the general character of other uses in the "I-1" Zone. These may include all manufacturing and processing uses, but do not include extractive or mining operations.

2. Automobile, truck and machinery sales;

3. Ag processing facilities;

4. Uses permitted by Special Exception in the C-2 Local Commercial District.

C. Building Height Limit

1. None.

D. Lot Requirements

1. Minimum lot area shall be ten (10) acres.

2. Each lot in the "I-1" Zone shall have a side yard of not less than twenty (20) feet.

3.Each lot in the "I-1" Zone shall have a rear yard of not less than twenty (20) feet.

4. Each building on a lot in the "I-1" Zone shall be set back not less than sixty-five (65) feet from any road right-of-way.

4.4 "I-2" HEAVY INDUSTRIAL DISTRICT

A. Uses Permitted

1. None

B. Uses Permitted by Special Exception.

1. The following uses or location of such uses may be approved by the Board of Adjustment:

a. Ag processing facilities;

b. Crematory;

~~c. Explosive manufacture or storage;~~

~~d. Fertilizer manufacture;~~

~~e. Incineration or reduction of garbage, dead animals, fat or refuse;~~

~~f. Soap manufacture;~~

~~g. Tanning of leather, rawhide, or skins;~~

~~h. And in general, those uses which have been declared a nuisance in any court of record, or which may be noxious or offensive by reason of odor, dust, gas, smoke or noise.~~

~~C. Building Height Limit~~

~~1. None.~~

~~D. Lot Requirements~~

~~1. Same as outlined under Lot Requirements for "I-1" Zone, sub-paragraphs 1, 2 and 4. And in addition, all storage within five hundred (500) feet of a Residential District must be completely enclosed in a building or by a solid walled fence at least two (2) feet above the highest point of the stock pile which fence shall be maintained in safe and good repair. The County may require hard surfacing of parking lots.~~

CHAPTER 3.06. "I" INDUSTRIAL DISTRICT.

Section 3.06.01. Permitted Uses.

1. **On-premise signs.**
2. **Field crops and grasslands.**
3. **Accessory uses and buildings.**

Section 3.06.02. Conditional Uses.

1. **Uses permitted by conditional use in the "C" Commercial District, except implement sales and service; recreation vehicle sales and parks, bar/tavern, commercial stables, veterinary clinics convenience store/service station, Seasonal retail stands utilizing a permanent structure, commercial orchards, tree farms, truck gardening, and greenhouses; and Motel/hotel.**
2. **Agricultural product processing facilities such as ethanol plants and corn/soybean processing.**
3. **Crematory.**
4. **Explosive manufacture or storage.**
5. **Fertilizer manufacture.**

6. Incineration or reduction of garbage, dead animals, fat or refuse.

7. Soap manufacture.

8. Tanning of leather, rawhide, or skins.

9. Off-premise signs.

10. Adult uses. (See Chapter 5.30).

11. Any permitted residential use in the "A" Agricultural District, where such use existed prior to June 18, 1974, and where such conditional use, if granted, will be limited to rebuilding, remodeling, of such pre-existing residence or construction of a new residence on the site of the pre-existing residence.

12. Other industrial or commercial uses determined by the Board of Adjustment to be consistent with the intent of this District that can meet the performance standards listed in section 3.06.04.

Section 3.06.03. Area Regulations.

1. Lot Area. Lot area shall be determined by need, setback, side yards, rear yards, parking requirements, freight handling requirements, building site and future expansion; however, in no case shall a lot have less than ten (10) acres. An applicant for a conditional use shall provide a proposed site plan which can be reviewed by the Board of Adjustment.

2. Front Yard: The minimum depth of the front yard shall be one hundred (100) feet and in no case shall an accessory building be located or extend into the front yard. In the case of a corner lot, front yards shall be provided on both streets. Exception: The front yard setback for off-premise signs, where the face of the sign is perpendicular to the Interstate 29 right-of-way, shall be ten (10) feet.

3. Side Yards. On lots adjacent to a residential area, all buildings and incidental areas shall be located so as to provide a minimum side yard of one hundred (100) feet, which shall be landscaped on the side adjacent to the residential area. All other side yards shall be a minimum of fifty (50) feet.

4. Rear Yards. No building shall be constructed within fifty (50) feet of the rear lot line. The rear yard shall be one hundred (100) feet if the lot abuts a major highway.

5. Height Regulations. None.

6. Storage. All outdoor storage within five hundred (500) feet of a residential dwelling shall be completely enclosed in a building or by a solid walled fence at least two (2) feet above the highest point of the stock pile which fence shall be maintained in safe and good repair. The County may require hard surfacing of parking lots.

7. Access. For all proposed uses and structures adjacent to a State highway, an access permit from the State of South Dakota Department of Transportation shall be required prior to the filing of a plat or the issuance of a building/use permit.

Section 3.06.04. Performance Standards.

1. **Noise. All noise shall be muffled so as not to be objectionable due to intermittence, beat frequency or shrillness.**

2. **Air Pollution. State emission standards shall be met by all possible sources of air pollution. In any case, there shall not be discharged from any sources whatsoever such quantities of air contaminants, smoke or detriment, nuisance or annoyance to any considerable number of persons or to the public in general to endanger the comfort, health or safety of any such considerable number of persons or have a natural tendency to cause injury or damage to business, vegetation or property.**

3. **Odor. The emission of odorous matter in such quantities as to be readily detectable at any point along lot lines or to produce a public nuisance or hazard beyond lot lines is prohibited.**

4. **Glare, Heat or Radiation. Every use shall be so operated that there is no emission of heat, glare or radiation visible or discernable beyond the property line.**

5. **Vibration. Every use shall be so operated that the ground vibration inherently and recurrently generated is not perceptible, without instruments, at any point on the property line.**

6. **Sewage and Liquid Wastes. No operation shall be carried on which involves the discharge into a sewer, watercourse, river or the ground of liquid wastes of any radioactive nature, or liquid wastes of chemical nature, which are detrimental to normal sewage plant operations or corrosive or damaging to sewer pipes and installations.**

7. **Fire Hazard. All flammable substances involved in any activity or use, shall be handled in conformance with the standard of the National Board of Fire Underwriters and any additional regulations that may from time to time be adopted by the County Commissioners**

8. **Physical Appearance. All operations shall be carried on within an enclosed building except that new or operable equipment may be displayed or stored in the open and waste materials stored in enclosed containers not readily visible from the street.**

CHAPTER ~~4.5~~ 3.07 "LP" LAKE PARK DISTRICT.

~~A. Intent~~

~~Lake Park District is to provide for orderly low residential and recreational development, together with certain public facilities, customary home occupations, and certain commercial establishments along lake shores.~~

Section 3.07.01. ~~B~~ Areas Contained in Lake Park District.

All land unless otherwise zoned, within **one thousand** (1,000) feet of the **State Established** normal high water elevation of **Lake Pelican, Punished Woman Lake or** a designated lake, **as identified on the Official Zoning Map**, shall be contained in the Lake Park District and usage shall conform to the regulations for this district.

Section 3.07.02. ~~C~~ Permitted Uses.

1. ~~Single-family residential usage, including Type A manufactured homes; and (Type B manufactured homes provided that provisions of Section 5.7 are met)~~ **Site-built single-family dwelling.**
2. Public ~~and private~~ parks **and recreation areas**.
3. Agricultural or horticulture uses **excluding concentrated animal feeding operations.**
4. ~~Commercial outdoor recreation areas similar to public areas~~ **Modular home**.
5. ~~Home occupations~~ **Type A manufactured home.**
6. **Attached garages and unattached private garages with sidewalls less than ten (10) feet and conform to the design of the house.**
7. **Essential public services.**
8. **Accessory uses to include but not limited to boathouses further than fifty (50') feet from the highwater mark, or sheds, piers and docks.**

Section 3.07.03. Conditional Uses.

1. **Twin homes.**
2. **Private parks and campgrounds.**
3. **Boathouses within fifty (50) feet of high water mark.**
4. **Multiple family dwellings, including condominiums.**
5. **Unattached garages with sidewalls greater than ten (10) feet or do not conform to the design of the house.**
6. **Type B manufactured home.**

7. Commercial storage garages.

8. Home occupation.

9. Extended home occupation.

Section 3.07.04 ~~D~~ Area Regulations

~~D. Minimum Lot Requirements~~

~~Each lot shall have a depth of not less than 200 feet and shall have a shoreline frontage width of not less than 165 feet. The minimum road frontage shall be not less than 50 feet in width. Lots shall be a minimum of two (2) acres.~~

~~E. Minimum Setback~~

~~Each building on a lot shall be set back not less than sixty-five (65) feet from the normal high water mark and a minimum of sixty-five (65) feet from all roads. Side yards shall not be less than twenty-five (25) feet from the property line.~~

1. Table 3.07.04.1 Lots Adjacent to Lake

	Minimum Lot Area (Sq. Ft)	Minimum Lot Width	Minimum Lot Depth	Minimum Side Yard	Minimum Front Yard (1)	Minimum Rear Yard (Lake Front)	Maximum Height
Central Sewer or Holding Tank and Rural or Municipal Water							
Single Family Dwelling	15,000	75’	200’	8’	30’	65’	30’
Multiple Family Dwelling	20,000	100’	200’	10’	30’	65’	45’
Septic Tank with Drain Field or Mound system combined with Private Well, Rural or Municipal Water							
Single Family Dwelling	87,120 (2 acres)	100’	200’	15’	30’	65’	30’

(1) Side of lot facing road right-of-way or access easement.

2. Table 3.07.04.2 Lots Not Adjacent to Lake

	Minimum Lot Area (Sq. Ft)	Minimum Lot Width	Minimum Lot Depth	Minimum Side Yard	Minimum Front Yard (1)	Minimum Rear Yard	Maximum Height
Central Sewer/Holding Tank and Rural or Municipal Water							
Single Family Dwelling	15,000	75'	200'	8'	30'	50'	30'
Multiple Family Dwelling	20,000	100'	200'	10'	30'	50'	45'
Septic Tank with Drain Field and Private Well, Rural or Municipal Water							
Single Family Dwelling	87,120 (2 acres)	100'	200'	25'	65'	50'	30'

i. Side of lot facing road right-of-way or access easement.

3. Regulations applicable to all lots in the Lake Park District:

a. On those lots platted prior to June 18, 1974 which have a lot width of less than seventy-five (75) feet, each building shall have a side yard of not less than a distance equal to ten (10) percent of the lot width. Under no circumstances shall a building have a side yard of less than five (5) feet. Roof overhangs may infringe upon the side yard requirements no more than one and one-half (1.5) feet.

b. Regarding Lake Pelican, no structure except piers and docks shall be placed at an elevation such that the lowest floor, including basement or crawl space, is less than one (1) foot above the base flood elevation of 1716.3' NGVD 1929 or 1717' NAVD 1988. In those instances where sufficient data on known high water levels are not available, the elevation line of permanent terrestrial vegetation shall be used as the estimated high water elevation. When fill is required to meet this elevation, the fill shall be required to stabilize or be tamped down before construction is begun.

c. Regarding other Lake Park Districts, no structure except piers and docks shall be placed at an elevation such that the lowest floor, including basement or crawl space, is less than one (1) foot above the base flood elevation. In those instances where sufficient data on known high water levels are not available, the elevation line of permanent terrestrial vegetation shall be used as the estimated high water elevation. When fill is required to meet this elevation, the fill shall be required to stabilize or be tamped down before construction is begun.

d. Sealed holding tanks for dwellings are required for all lots of record containing less than twenty thousand (20,000) square feet and not connected to a central sewer system. Existing septic tanks and drainfields (as of January 1, 2006) on lots with an area of less than twenty thousand (20,000) square feet are considered nonconforming uses and shall not be allowed to be replaced after the adoption of this ordinance.

e. There shall be no more than one (1) principal residential building on any parcel of land.

f. Where two (2) parcels of land are purchased and joined together by one (1) common boundary, the setbacks established above shall pertain to the perimeter of the combined lots.

g. The maximum size of attached and unattached garages shall be a function of the size of the lot area. The size of garages, attached and unattached, located on nonconforming lots of record shall conform to the following requirements Table 3.07.04.3:

Table 3.07.04.3

Lot Area	Maximum Size
1 to 10,000 Square Feet	Seven (7) percent of the lot area
10,001 to 20,000 Square Feet	Seven hundred (700) square feet or six (6) percent of the lot area – whichever is greater
20,0001 to 43,560 Square Feet	One thousand two hundred (1,200) square feet or five (5) percent of the lot area – whichever is greater
43,561 to 87,119 Square Feet	Two thousand one hundred seventy eight (2,178) square feet or four (4) percent of the lot area – whichever is greater
Over 87,120 Square Feet	Three thousand four hundred eighty five (3,485) square feet or three (3) percent of the lot area – whichever is greater

~~F. Permitted Accessory Uses~~

~~1. Boathouses, piers, and docks.~~

Section 3.07.05. ~~G~~ **~~Minimum~~** Shoreland **Alterations.**

1. These regulations are deemed necessary along the shores of natural waters to protect scenic beauty, control erosion, and reduce effluent and nutrient flow from the ~~shoreland~~ **shoreline**.

2. Removal of Shore Cover. Tree and shrub cutting in a strip paralleling the shoreline and extending a minimum of thirty-five (35) feet inland from all points along the normal high water mark of the shoreline shall be limited in accordance with the following provisions.

1. Cutting shall, at a minimum, leave sufficient cover to screen cars, buildings, except boathouses, as seen from the water; to preserve natural beauty and to control erosion.

2. Natural shrubbery shall, at a minimum, be preserved as far as practicable, and where removed it shall be replaced with other vegetation that is equally effective in retarding run-off, preventing erosion, and preserving natural beauty.

3. The removal of natural shrubbery and its replacement shall require the granting of a permit by the County Zoning Officer. Application for such permit shall be accompanied by a plan showing the work to be accomplished.

3. Shoreline Stabilization

Shoreline stabilization, including but not limited to riprapping and retaining walls, shall require the granting of a permit by the Zoning Officer.

Section 3.07.06. ~~H~~ **~~Filling~~ Filling, Grading, Lagooning, and Dredging.**

1. Filling, grading, lagooning, and dredging which would result in substantial detriment to natural waters by reason of erosion, sedimentation, or impairment of fish and aquatic life is prohibited within an "LP" District.

2. A permit shall be required for any filling or grading.

a. This does not apply to soil conservation practices such as terraces, run-off diversions and grassed waterways which are used for sediment retardation.

b. Issuance of the permit shall include review from the Corps of Engineers and/or other appropriate State and/or Federal agencies

3. A permit shall be required before constructing, dredging, or commencing work on an artificial waterway, canal, ditch, lagoon, pond, lake or similar waterway.

   a. This requirement does not apply to soil conservation practices such as terraces, run-off diversions, and grassed waterways which are used for sediment retardation.

   b. Issuance of the permit shall include review from the Corps of Engineers and/or other appropriate State and/or Federal agencies.

Section 3.07.07. ~~I~~ Sewage Systems.

1. The developer of any plat shall provide for **County approved** ~~adequate~~ sewage systems and provide provisions that are binding on the developer before such plat is approved. At a minimum, the installation and utilization of individual on-site wastewater systems shall meet state regulations, Chapter 74:53:01.

2. The developer of any plat shall be liable for the execution of the provisions required above to protect waters of the state from pollution and shall be liable for any pollution that occurs for failure to execute such provisions.

Section 3.07.08. ~~J~~ Agricultural Easement.

1. All new residential development (farm and non-farm) in the Lake Park District shall be required to file an "Agricultural Easement" before the issuance of a building permit.

~~K. Expansion of the Existing Lake Park District Boundaries~~

~~The Lake Park District may be expanded beyond the originally defined "within one thousand (1,000) feet of the normal high water line of a designated lake" boundary by an additional distance not to exceed twelve hundred (1,200) feet.~~

~~1. Lake Park District Expansion Development Standards and Requirements~~

~~a. The expansion of the Lake Park District shall not be permitted on a parcel of land less than twenty (20) acres in area.~~

~~b. All roads, common facilities, and open spaces within the Lake Park District Expansion shall be maintained by a homeowner's association.~~

~~c. Lake Park District expansions within two miles of Watertown and one (1) mile of any other incorporated community will be submitted to the community governing body for review and comment.~~

~~d. Where a proposed Lake Park District expansion is within two miles of Watertown or one (1) mile of any other incorporated area, the Codington County Planning Commission may request the developer to construct proposed improvements to specifications approved by the community's governing body.~~

~~e. Lake Park District Expansions must have access to a concrete or bituminous asphalt street.~~

~~f. Lake Park District Expansions are not allowed over the shallow aquifer or wellhead protection areas.~~

~~EXCEPTION: A Lake Park District expansion may be allowed over a shallow aquifer if a Board of Adjustment and DENR approved sanitary sewer system is implemented. Approved sanitary sewer systems are subject to the Department of Environment and Natural Resources regulations 74:53:01 and amendments thereto.~~

~~2. Procedure for expansion of Lake Park District~~

~~The procedure found in the 4.8 Planned Residential District Paragraph B shall be used in the expansion of the Lake Park District~~

CHAPTER ~~4.6~~ **3.08. "NR" NATURAL RESOURCE DISTRICT.**

Section 3.08.01. ~~A~~ **Permitted Uses**.

1. Wildlife production areas.
2. Game refuges.
3. Historic sites and/or monuments.
4. Designated natural prairies.
5. Public hunting and fishing access areas.

Section 3.08.02. Conditional Uses.

~~B. Uses Permitted by Special Permit if Deemed Not Detrimental to the District~~

1. Transportation and utility easements and rights-of-way.
2. Utility substations.
3. Public parks and/or playgrounds.
4. Horticulture uses and livestock grazing.

5. Essential services.

6. Mineral exploration and development, sand, gravel, or quarry operation.

Section 3.08.03. Shoreline Alterations, Filling, Grading, Dredging, and Lagooning.

1. Shoreline stabilization, filling, grading, dredging, and lagooning projects in the "NR" District shall be governed by Sections 3.07.05 and 3.07.06 of this ordinance.

CHAPTER ~~4.8~~ 3.09 "PR" PLANNED RESIDENTIAL DISTRICT.

~~The Planned Residential District is to provide for residential subdivisions which, through their design and development, will limit the amount of agricultural land that is taken out of production, will not require additional public expenditures for roads or other improvements and services, and which will minimize the conflict between farm and non-farm land uses~~.

Section 3.09.01. ~~A~~ Planned Residential District ~~Development~~ Standards and Requirements.

1. The use of land in the Planned Residential District shall be limited to non-farm single-family dwelling units and their supporting services. **However, the Board of Adjustment may consider commercial and/or public uses supportive of the proposed Planned Residential District.**

2. The Planned Residential District shall not be permitted on a parcel of land less than thirty-five (35) acres in area.

3. All roads, common facilities, and open spaces within the Planned Residential District shall be maintained by a homeowner's association.

4. Planned Residential Districts within two miles of Watertown and one (1) mile of any other incorporated community will be submitted to the community governing body for review and comment.

5. Where a proposed Planned Residential District is within two **(2)** miles of Watertown or one (1) mile of any other incorporated area, the Codington County Planning Commission may ~~request~~ **require** the developer to construct proposed improvements to specifications approved by the community's governing body.

6. Strip or linear development proposals along a road or highway will not qualify as a Planned Residential District.

7. The overall density of a Planned Residential District shall not be less than one (1) housing unit per three (3) acres of land.

8. Minimum lot size shall not be less than that required by the South Dakota Department of Environment and Natural Resources regulations on Private Sewage Disposal Systems (Chapter 34:04:01).

9. In addition to the Codington County Zoning Regulations, any proposed Planned Residential Districts are subject to platting and subdivision regulations of the county.

10. Access to public dedicated streets and roads shall be limited. **Dwelling units shall not access public road right-of-ways. Dwelling unit access shall be provided through the interior street/road system.**

11. Planned Residential Districts must have access to a concrete or bituminous-asphalt street. **Further all interior streets constructed within the Planned Residential District shall be either concrete or asphalt with the design to be approved by the County Highway Superintendent.**

12. Planned Residential Districts **are** not allowed over the shallow aquifer or wellhead protection areas.

EXCEPTION: A Planned Residential District may be allowed over a shallow aquifer if ~~a Board of Adjustment and DENR approved sanitary sewer system is implemented. Approved sanitary sewer systems are subject to the Department of Environment and Natural Resources regulations 74:53:01 and amendments thereto.~~ **the proposed Planned Residential District utilizes a Board of Adjustment approved central sanitary sewer collection system, which may consist of holding tanks, trunk lines, lift stations, and treatment facilities.**

13. ~~An~~ Easement**s per 3.04.03.9 of this ordinance** shall be required to be placed on any lot in a Planned Residential District in order to protect agricultural operations or practices in the adjoining areas.

Section 3.09.02. ~~B~~ Procedure for Planned Residential District ~~Development~~.

The following shall be observed when a Planned **Residential District** ~~Development~~ proposal is submitted for consideration:

1. An applicant for consideration under the terms of this district, who must be owner, lessee, or the holder of a written purchase option of the tract of land under consideration, shall submit ~~eleven (11)~~ **three (3)** copies of a preliminary development plan to the commission for study at least seven (7) days prior to the commission meeting at which it is to be considered. The preliminary plan shall include the following information.

    a. Location map showing the relationship of the proposed district to existing roads and property lines;

    b. Proposed land uses, building locations, and housing unit densities;

    c. Proposed circulation pattern indicating the status of street ownership;

    d. Proposed open space uses;

    e. Proposed grading and drainage pattern;

    f. Proposed method of water supply and sewage disposal;

    g. Relation of the proposed development to the surrounding area and comprehensive plan.

2. Copies of the proposed water and **sanitary** sewer system ~~will~~ **may** be submitted to the South Dakota Department of Environment and Natural Resources for study and comment.

3. A list and schedule of improvements to be completed by the developer must be submitted.

4. In reviewing the plan, the Commission shall need to determine that:

    a. Resulting development will not be inconsistent with the Comprehensive Plan objectives or zoning provisions of the area.

    b. The plan can be completed within a reasonable period of time.

c. The streets are adequate to support the anticipated traffic and the development will not overload the roads outside the planned area.

d. Proposed utility and drainage facilities are adequate for the population densities proposed.

~~5. If, in the opinion of the Planning Commission, the foregoing provisions are satisfied, the proposal shall be processed according to this section. If the Commission finds to the contrary, they may recommend the application be denied or return the plan to the application for revision.~~

~~6.~~**5**. In addition to the requirements of this section, the **Planning** Commission may attach conditions it finds are necessary to carry out the purpose of this ordinance.

~~7~~**6**. Before approving a Planned **Residential** ~~Development~~ District, the Planning Commission must have copies of proposed deed restrictions, agreements for maintenance by the homeowners' association of common facilities and open spaces, guarantees (surety bonds, etc.) by the developer for the completion of the development in accordance with the approved plan, and an agreement binding successors who may take over completion of the development to conditions of the plan approval.

~~8~~**7**. The Planning Commission shall follow the procedure for considering an amendment to the Codington County Official Zoning Map before approving a Planned Residential District.

~~9~~**8**. Permits for construction in a Planned **Residential** ~~Development~~ District shall be issued only on the basis of the approved plan. Any changes in the approved plan shall be submitted to the Commission for processing as an amendment to this ordinance.

CHAPTER 3.10. TD" TOWN DISTRICT.

Section 3.10.02. ~~A~~ Permitted Uses.

1. Single-family residential usage, including Type A manufactured homes permitted; Type B manufactured homes, provided that provisions of Section 5.7 are met.

2. Public parks.

3. Agriculture and horticulture uses, excluding feedlots.

~~4. Home occupation.~~

Section 3.10.02. ~~B Special Exception~~ Conditional Uses.

1. Retail and service business.

2. Light manufacturing.

3. Bar or tavern.

4. Warehouse.

5. Multi-family housing

6. ~~Contractors' offices, shops and yards~~ **Home occupation.**

7. Manufactured home park.

8. The Board of Adjustment may permit other uses which in its opinion are not detrimental to other uses. These may include manufacturing and processing uses.

Section 3.10.03. ~~C~~ Area Regulations

1. **Residential Uses/Lots - Structures on all corner lots shall observe two (2) front yards. The depth of the front yard on each street which the lot abuts, shall be as follows.**

   a. Minimum Yard Requirements:

   Front -- Twenty-five (25) feet
   Side -- Fifteen (15) feet
   Rear -- Twenty-five (25) feet

   b. Minimum Lot Size:

   Public Water Supply/Septic Tank -- 20,000 Sq. Ft.
   Well/Septic Tank ---------- 43,560 Sq. Ft.
   Public Water Supply/Public Sewer - 9,600 Sq. Ft.

2. Commercial Uses/Lots - Lot size shall be determined by off-street parking needs; availability of water and sewage disposal systems; adjacent land uses; need for screening; and type of business. Front, side, and rear yards shall be determined by the Board of Adjustment ~~after recommendation from the Planning Commission.~~

3. **Industrial Uses/Lots**

Lot size shall be determined by off-street parking needs; impact of adjoining land use and need for screening or buffering from residential areas; availability of water and sewage disposal facilities; type of manufacturing or storage facilities; type of manufacturing or storage facilities. **Front, side, and rear yards shall be determined by the Board of Adjustment**.

CHAPTER ~~4.7~~ **3.11. FLOOD** ~~DAMAGE PREVENTION REGULATIONS~~ **PROTECTION OVERLAY DISTRICT.**

Section 3.11.01. ~~A.~~**1. Statutory Authorization, Findings of Fact, Purpose and Methods of Reducing Flood Losses.**

1. Statutory Authorization

The Legislature of the State of South Dakota has in SDCL Chapter 11-2 delegated the responsibility to local governmental units to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry. Therefore, the County Commissioners of Codington County, South Dakota, ordain as follows:

2. Findings of Fact

~~i.~~**a**. The flood hazard areas of Codington County are subject to periodic inundation which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety, and general welfare.

~~ii.~~**b** These flood losses are caused by the cumulative effect of obstructions in ~~areas of special flood hazards which increase flood heights and velocities, and when inadequately anchored, damage uses in other areas. Uses that are inadequately flood-proofed, elevated or otherwise protected from flood damage also contribute to the flood loss.~~ **floodplains which cause an increase in flood heights and velocities, and by the occupancy of flood hazards areas by uses vulnerable to floods and hazardous to other lands because they are inadequately elevated, floodproofed or otherwise protected from flood damage.**

~~3.~~**c3**. Statement of Purpose

It is the purpose of these regulations to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions to specific areas by provisions designed:

~~i.~~**a**. To protect human life and health;

~~ii.~~**b**.To minimize expenditure of public money for costly flood control projects;

~~iii.~~**c**. To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;

~~iv.~~**d**. To minimize prolonged business interruptions;

~~v.~~**e**.To minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in areas of special flood hazard;

~~vi.~~**f**.To help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future flood blight areas;

~~vii.~~**g.** To ensure that potential buyers are notified that property is in an area of special flood hazard; and

~~viii.~~**h.** To ensure that those who occupy the areas of special flood hazards assume responsibility for their actions.

~~4.~~**d4**. Methods of Reducing Flood Losses

In order to accomplish its purposes, these regulations include methods and provisions for:

~~i.~~**a**. Restricting or prohibiting uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;

~~ii.~~**b**. Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;

~~iii.~~**c**. Controlling the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel flood waters;

~~iv.~~**d**. Controlling filling, grading, dredging, and other development which may increase flood damage; and

~~v.~~**e**. Preventing or regulating the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards in other areas.

~~B. Definitions.~~

~~Unless specifically defined below, words or phrases used in these regulations shall be interpreted so as to give them the meaning they have in common usage and to give these regulations the most reasonable application.~~

~~"Area of special flood hazard" means the land in the floodplain subject to a one percent or greater chance of flooding in any given year. The area of a special flood hazard refers top the area subject to inundation during the base (100-year flood.~~

~~"Base flood" means the flood having a once percent chance of being equaled or exceeded in any given year.~~

~~"Development" means any man-made change to improved or unimproved real estate, including but not limited to, buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations located within the area of special flood hazard.~~

~~"Flood" or "flooding" means a general and temporary condition of partial or complete inundation of normally dry land areas from:~~

~~1. The overflow of inland or tidal waters and/or~~

~~2. The unusual and rapid accumulation of runoff of surface waters from any source.~~

"Flood Insurance Rate Map (FIRM)" means an official map of a community on which the Federal Emergency Management Agency has delineated areas of special flood hazard designated as Zone A.

"Floodway" - The channel and the adjacent areas that must be reserved in order to meet the minimum requirement of the National Flood Insurance Program of providing for the discharge of the base flood without cumulatively increasing the water surface elevation more than one (1) foot. However if there are identifiable flood impacts either upstream or downstream, based upon a scientific engineering study, a more stringent definition of floodway may be justified. That definition would include the channel and the adjacent areas that must be reserved in order to provide for the discharge of the base flood without cumulatively increasing the water surface elevation to a point which may result in additional damages to upstream/downstream properties.

"Manufactured home" means a structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when connected to the required utilities. This term also includes park trailers, travel trailers and other similar vehicles placed on a site for greater than 180 consecutive days.

"Structure" means a walled and roofed building or manufactured home that is principally above ground.

"Substantial improvement" means any repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure either:

1. Before the improvement or repair is started, or

2. If the structure has been damaged and is being restored, before the damage occurred. For the purpose of this designation, "substantial improvement" is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure.

   The term does not, however, include either:

   c. Any project for improvement of a structure to comply with existing State or local health, sanitary, or safety code specifications which are solely necessary to assure safe living conditions, or

   d. Any alteration of a structure listed on the National Register of Historic Places or a State Inventory of Historic Places.

Section 3.11.02. C.2.General Provisions.

1**a1.** Lands to which this Ordinance Applies

This ordinance shall apply to all areas of special flood hazards within the jurisdiction of Codington County.

2**b2**. Basis for Establishing the Areas of Special Flood Hazard

The areas of special flood hazard identified by the Federal Emergency Management Agency in its Flood Insurance Rate Map (FIRM), **a scientific and engineering report entitled, "The Flood Insurance Study for Codington County,"** dated February 1, 1986 **January**

16, 2009, ~~is adopted by reference and declared to be part of these regulations. The FIRM is on file at the County Auditor's Office, Codington County Courthouse, Watertown, SD~~ **with accompanying Flood Insurance Rate Maps and Flood Boundary-Floodway Maps (FIRM and FBFM) and any revisions thereto are hereby adopted by reference and declared to be a part of this ordinance.**

~~3~~**c3**. Compliance

No structure or land shall hereafter be constructed, located, extended, or altered without full compliance with the terms of these regulations and other applicable regulations.

~~4~~**d4**. Abrogation and Greater Restrictions

These regulations are not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where these regulations and another ordinance, easement, covenant, or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

~~5~~**e5**.Interpretation

In the interpretation of these regulations, all provisions shall be:

a. Considered as minimum requirements;

b. Liberally construed in favor of the governing body; and

c. Deemed neither to limit nor repeal any other powers granted under State statutes.

~~6~~f**6**.Warning and Disclaimer of Liability

The degree of flood protection required by these regulations is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. These regulations do not imply that land outside the areas of special flood hazards or uses permitted within such areas of special flood hazards or uses permitted within such areas will be free from flooding or flood damages. These regulations shall not create liability on the part of Codington County, any officer or employee thereof, or the Federal Emergency Management Agency for any flood damages that result from reliance on these regulations or any administrative decision lawfully made thereunder.

Section 3.11.03. ~~D.3.~~ Administration.

~~1~~**a1.** Establishment of Development Permit

A development permit shall be obtained before construction or development begins within any area of special flood hazard established in Section ~~C.2~~**2.b 3.11.02.2.** (BASIS FOR ESTABLISHING THE AREAS OF SPECIAL FLOOD HAZARD). Application for a development permit shall be made on forms furnished by the Zoning Officer and may include, but not be limited to: Plans in duplicate drawn to scale showing the nature, location, dimensions, and elevations of the area in questions; existing or proposed structures, fill, storage of materials, drainage facilities; and the location of the foregoing. Specifically, the following information is required:

~~i.~~**a**. Elevation in relation to mean sea level of the lowest floor (including basement) of all structures;

~~ii.~~**b**. Elevation in relation to mean sea level to which any structure has been floodproofed;

~~iii.~~**c**. Certification by a registered professional engineer or architect that the floodproofing methods for any non-residential structure meet the floodproofing criteria in ~~E.2.b.~~ **~~4.b.ii.~~ 3.11.04.2.b.** (Non-residential Construction); and

~~iv.~~**d**. Description of the extent to which any watercourse will be altered or relocated as a result of proposed development.

~~2b~~2. Designation of the Zoning Officer

The Zoning Officer is hereby appointed to administer and implement ~~these regulations by granting or denying development permit applications in accordance with their provisions~~ the provisions of this ordinance and other appropriate sections of 44 CFR (National Flood Insurance Program Regulations) pertaining to floodplain management.

~~3c~~3. Duties and Responsibilities of the Zoning Officer

Duties of the Zoning Officer shall include but not be limited to:

~~a.~~**~~i.~~a.** Permit Review

~~i.~~**~~a.~~i.** Review of all development permits to determine that the permit requirements of these regulations have been satisfied.

~~ii.~~**~~b.~~ii.** Review all development permit to determine that all necessary permits have been obtained from those Federal, State or local governmental agencies from which prior approval is required.

~~iii.~~**~~c.~~iii.** Review all development permits to determine if the proposed development adversely affects the flood carrying capacity of the area of special flood hazard. For the purposes of these regulations, “adversely affects” means damage to adjacent properties because of rises in flood stages attributed to physical changes of the channel and the adjacent overbank areas.

~~iv.~~**~~d.~~iv.** If it is determined that there is no adverse effect and the development is not a building, then the permit shall be granted without further consideration.

~~v.~~**~~e.~~v.** If it is determined that there is an adverse effect, then technical justification (i.e., a registered professional engineer’s certification) for the proposed development shall be required.

~~vi.~~**~~f.~~vi.** If the proposed development is a building, then the provisions of these regulations shall apply.

~~b.~~**~~i.~~b.** Uses of Other Base Flood Data

i. When base flood elevation data has not been provided in accordance with Section ~~C.2.~~ **~~2.b.~~ 3.11.02.2.** BASIS FOR ESTABLISHING THE AREAS OF SPECIAL FLOOD HAZARD, the zoning Officer shall obtain, review, and reasonably utilize any base flood elevation and floodway data available from a Federal, State, or other source as criteria for requiring that new construction, substantial improvements, or other development in Zone A are administered in accordance with ~~E.2.~~ **~~4.b.~~ 3.11.04.2,** SPECIFIC STANDARDS.

ii. When a regulatory floodway has not been designated, the Floodplain Administrator must require that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.

iii. Under the provisions of 44 CFR Chapter 1, Section 65.12, of the National Flood Insurance Program regulations, a community may approve certain development in Zones A1-30, AE, AH, on the community's FIRM which increases the water surface elevation of the base flood by more than one foot, provided that the community first applies for a conditional FIRM revision through FEMA (Conditional Letter of Map Revision).

~~3.d.~~**4.** Information to be Obtained and Maintained

~~a.~~**i.a.** Obtain and record the actual elevation (in relation to mean sea level) of the lowest floor (including basement) of all new or substantially improved structures, and whether or not the structure contains a basement.

~~b.~~**ii.b.** For all new or substantially improved floodproofed structures:

~~1.~~**a.i.** Verify and record the actual elevation (in relation to mean sea level) to which the structure has been floodproofed.

~~2.~~**b.ii.** Maintain the floodproofing certification required in Section ~~D.1.c.~~ **3.a.iii. 3.11.03.1.c.**

~~c.~~**iii.c.** Maintain for public inspection all records pertaining to the provisions of these regulations.

~~4.~~**e.5.** Alteration of Watercourses

a. Assure that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained.

~~a.~~**i.b.** Notify adjacent communities and State Coordinating Agency prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Emergency Management Agency.

~~b.~~**2.c.** Require that maintenance be provided within the altered or relocated portion of said watercourse so that the flood carrying capacity is not diminished.

~~5.~~**f.6.** Interpretation of FIRM Boundaries

Make interpretations, where needed, as to the exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be conflict between a mapped boundary and actual field conditions).

7. VARIANCE PROCEDURES

a. The appeal Board as established by the community shall hear and render judgment on requests for variances from the requirements of this ordinance.

b. The Appeal Board shall hear and render judgment on an appeal only when it is alleged there is an error in any requirement, decision, or determination made by the Floodplain Administrator in the enforcement or administration of this ordinance.

c. Any person or persons aggrieved by the decision of the Appeal Board may appeal such decision in the courts of competent jurisdiction.

d. The Floodplain Administrator shall maintain a record of all actions involving an appeal and shall report variances to the Federal Emergency Management Agency upon request.

e. Variances may be issued for the reconstruction, rehabilitation or restoration of structures listed on the National Register of Historic Places or the State Inventory of Historic Places, without regard to the procedures set forth in the remainder of this ordinance.

f. Variances may be issued for new construction and substantial improvements to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, providing the relevant factors in 3.11.03 (4) (b) (i) have been fully considered. As the lot size increases beyond the one-half acre, the technical justification required for issuing the variance increases.

g. Upon consideration of the factors noted above and the intent of this ordinance, the Appeal Board may attach such conditions to the granting of variances as it deems necessary to further the purpose and objectives of this ordinance (3.11.01 (3)).

h. Variances shall not be issued within any designated floodway if any increase in flood levels during the base flood discharge would result.

i. Variances may be issued for the repair or rehabilitation of historic structures upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure and the variance is the minimum necessary to preserve the historic character and design of the structure.

j. Prerequisites for granting variances:

i. Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.

ii. Variances shall only be issued upon:
- **a. showing a good and sufficient cause;**
- **b. a determination that failure to grant the variance would result in exceptional hardship to the applicant, and**
- **c. a determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances.**

iii. Any application to whom a variance is granted shall be given written notice that the structure will be permitted to be built with the lowest floor elevation below the base flood elevation, and that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation.

k. Variances may be issued by a community for new construction and substantial improvements and for other development necessary for the conduct of a functionally dependent use provided that:

i. the criteria outlined in 3.11.03 (7) (a-j) are met, and
ii. the structure or other development is protected by methods that minimize flood

iii. damages during the base flood and create no additional threats to public safety.

Section 3.11.04. ~~E.4.~~ Provisions for Flood Hazard Reduction

~~1~~**~~a.~~** ~~General Standards~~

~~In all areas of special flood hazards, the following standards are required:~~

~~a~~**~~i.~~** ~~Anchoring~~

~~i.~~**~~a.~~** ~~All new construction and substantial improvements shall be anchored to prevent flotation, collapse, or lateral movement of the structure and capable of resisting the hydrostatic and hydrodynamic loads.~~

~~ii.~~**~~b.~~** ~~All manufactured homes must be elevated and anchored to resist flotation, collapse or lateral movement and capable of resisting the hydrostatic and hydrodynamic loads. Methods of anchoring may include, but are not limited to use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable State and local anchoring requirements for resisting wind forces. Specific requirements may be:~~

~~a.~~**~~1.~~** ~~Over-the-top ties be provided at each of the four corners of the manufactured home, with two additional ties per side at intermediate locations, with manufactured homes less than~~ **~~fifty~~** ~~(50) feet long requiring one additional tie per side.~~

b.**2.**Frame ties be provided at each corner of the home with five additional ties per side at intermediate points, with manufactured homes less than **fifty** (50) feet long requiring four additional ties per side.

c.**3.**All components of the anchoring system be capable of carrying a force of **four thousand eight hundred** (4,800) pounds; and

d.**4.**Any additions to the manufactured home be similarly anchored.

b.**ii.** Construction Materials and Methods

i.**a.**All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.

ii.**b.**All new construction and substantial improvements shall be constructed using methods and practices that minimize flood damage.

iii.**c.**All new construction and substantial improvements shall be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

c.**iii.**Utilities

i.**a.**All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system;

ii.**b.**New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters; and

iii.**c.**On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

d.**iv.**Subdivision Proposals

i.**a.**All subdivision proposals shall be consistent with the need to minimize flood damage;

ii.**b.**All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize flood damage;

iii.**c.**All subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage; and

iv.**d.**Base flood elevation data shall be provided for subdivision proposals and other proposed development which contain at least **fifty** (50) lots or five (5) acres (whichever is less).

e.**v.**Encroachments

~~Encroachments, including fill, new construction, substantial improvements, and other development shall be prohibited in any **floodplain or** floodway unless a technical evaluation demonstrates that the encroachments will not result in any increase in flood levels during the occurrence of the base flood discharge.~~

~~2.**b.**Specific Standards~~

~~In all areas of special flood hazards where base flood elevation data has been provided as set forth in Section D.3.b. **3.c.ii** USE OF OTHER BASE FLOOD DATA, the following standards are required:~~
~~a.**i.** Residential Construction~~

~~New construction and substantial improvement of any residential structure shall have the lowest floor (including basement) elevated to one **(1)** foot above the flood elevation.~~

~~b.**ii.** Nonresidential Construction~~

~~New Construction and substantial improvement of any commercial, industrial or other nonresidential structure shall either have the lowest floor (including basement) elevated to one **(1)** foot above the level of the base flood elevation; or, together with attendant utility and sanitary facilities, shall:~~

~~i.**a.**Be floodproofed so that below the base flood elevation the structure is watertight with walls substantially impermeable to the passage of water;~~

~~ii.**b.**Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; and~~

~~iii.**c.**Be certified by a registered professional engineer or architect that the design and methods of construction are in accordance with accepted standards of practice for meeting the provisions of this paragraph. Such certifications shall be provided to the official as set forth in Section D**3. Administration.**~~

In all areas of special flood hazards the following provisions are required for all new construction and substantial improvements:

a. **All new construction or substantial improvements shall be designed (or modified) and adequately anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy;**

b. **All new construction or substantial improvements shall be constructed by methods and practices that minimize flood damage;**

c. **All new construction or substantial improvements shall be constructed with materials resistant to flood damage;**

d. **All new construction or substantial improvements shall be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water**

from entering or accumulating within the components during conditions of flooding.

e. All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system;

f. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the system and discharge from the systems into flood waters; and,

g. On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

1. Specific Standards

a. In all areas of special flood hazards where base flood elevation data has been provided as set forth in (i) 3.11.02 (2), (ii) 3.11.03 (3) (b), or 3.11.04 (3) (c), the following provisions are required:

b. Residential Construction -new construction and substantial improvement of any residential structure shall have the lowest floor (including basement), elevated to or above the base flood elevation. A registered professional engineer, architect, or land surveyor shall submit a certification to the Floodplain Administrator that the standard of this subsection as proposed in 3.11.03 (4) (a), is satisfied.

c. Nonresidential Construction - new construction and substantial improvements of any commercial, industrial or other nonresidential structure shall either have the lowest floor (including basement) elevated to or above the base flood level or together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. A registered professional engineer or architect shall develop and/or review structural design, specifications, and plans for the construction, and shall certify that the design and methods of construction are in accordance with accepted standards of practice as outlined in this subsection. A record of such certification which includes the specific elevation (in relation to mean sea level) to which such structures are floodproofed shall be maintained by the Floodplain Administrator.

d. Enclosures - new construction and substantial improvements, with fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or meet or exceed the following minimum criteria:
   i. A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided.
   ii. The bottom of all openings shall be no higher than one foot above grade.

iii. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.

e. Manufactured Homes

i. Require that all manufactured homes to be placed within Zone A on a community's FHBM or FIRM shall be installed using methods and practices which minimize flood damage. For the purposes of this requirement, manufactured homes must be elevated and anchored to resist flotation, collapse, or lateral movement. Methods of anchoring may include, but are not limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable State and local anchoring requirements for resisting wind forces.

ii. Require that manufactured homes that are placed or substantially improved within Zones A1-30, AH, and AE on the community's FIRM on sites

a. outside of a manufactured home park or subdivision,
b. in a new manufactured home park or subdivision,
c. in an expansion to an existing manufactured home park or subdivision, or
d. in an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as a result of a flood, be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.

iii. Require that manufactured homes be placed or substantially improved on sites in an existing manufactured home park or subdivision with Zones A1-30, AH and AE on the community's FIRM that are not subject to the provisions of paragraph (4) of this section be elevated so that either:

a. the lowest floor of the manufactured home is at or above the base flood elevation, or
b. the manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.

f. Recreational Vehicles - Require that recreational vehicles placed on sites within Zones A1-30, AH, and AE on the community's FIRM either:

i. be on the site for fewer than 180 consecutive days,
ii. be fully licensed and ready for highway use, or
iii. meet the permit requirements of 3.11.03 (4) (a), and the elevation and anchoring requirements for "manufactured homes" in this section. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions.

3. Standards for Subdivision Proposals

a. All subdivision proposals including the placement of manufactured home parks and subdivisions shall be consistent with 3.11.01 (2), (3), and (4) of this ordinance.
b. All proposals for the development of subdivisions including the placement of manufactured home parks and subdivisions shall meet Development Permit requirements of 3.11.03 (1), 3.11.03 (3); and the provisions of 3.11.04 of this ordinance.
c. Base flood elevation data shall be generated for subdivision proposals and other proposed development including the placement of manufactured home parks and subdivisions which is greater than 50 lots or 5 acres, whichever is lesser, if not otherwise provided pursuant to 3.11.02 (2) or 3.11.03 (3) (b) of this ordinance.
d. All subdivision proposals including the placement of manufactured home parks and subdivisions shall have adequate drainage provided to reduce exposure to flood hazards.
e. All subdivision proposals including the placement of manufactured home parks and subdivisions shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize or eliminate flood damage.

4. Standards for Areas of Shallow Flooding (AO/AH Zones)

Located within the areas of special flood hazard established 3.11.02 (2) are areas designated as shallow flooding. These areas have special flood hazards associated with base flood depths of 1 to 3 feet where a clearly defined channel does not exist and where the path of flooding is unpredictable and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow; therefore, the following provisions apply:

a. All new construction and substantial improvements of residential structures have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least two feet if no depth number is specified).

b. All new construction and substantial improvements of non-residential structures;
   i. have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least two feet if no depth number is specified), or;
   ii. together with attendant utility and sanitary facilities be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads of effects of buoyancy.

c. A registered professional engineer or architect shall submit a certification to the Floodplain Administrator that the standards of this Section, as proposed in 3.11.03 (4) (a), are satisfied.

d. Require within Zones AH or AO adequate drainage paths around structures on slopes, to guide flood waters around and away from proposed structures.

5. Floodways

Floodways - located within areas of special flood hazard established in 3.11.02 (2), are areas designated as floodways. Since the floodway is an extremely hazardous area due to the velocity of flood waters which carry debris, potential projectiles and erosion potential, the following provisions shall apply:

a. **Encroachments are prohibited, including fill, new construction, substantial improvements and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge.**

b. **If 3.11.04 (5) (a) above is satisfied, all new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of 3.11.04**

c. **Under the provisions of 44 CFR Chapter 1, Section 65.12, of the National Flood Insurance Regulations, a community may permit encroachments within the adopted regulatory floodway that would result in an increase in base flood elevations, provided that the community first applies for a conditional FIRM and floodway revision through FEMA.**

CHAPTER ~~4.10~~ 3.12 "AP" AQUIFER PROTECTION OVERLAY DISTRICT.

Section 3.12.01. Purpose and Intent.

The Codington County Planning Commission and Board of County Commissioners recognize (1) that residents of Codington County rely on ground water for a safe drinking water supply and (2) that certain land uses in Codington County can contaminate ground water particularly in shallow aquifers.

The purpose of the Aquifer Protection Overlay District is to protect public health and safety by minimizing contamination of the shallow aquifers of Codington County.

It is the intent to accomplish aquifer protection, as much as possible, by public education and securing public cooperation. Appropriate land use regulations will be imposed, however, which are in addition to those imposed in the underlying zoning districts or in other county regulations.

Section 3.12.02. Establishment/Delineation/Regulation of Aquifer Protection Overlay Zones.

Boundaries for the aquifer protection zones for the Aquifer Protection Overlay District are shown on the Official Zoning map~~s~~ **based upon data** prepared by Banner Associates, Brookings, South Dakota. ~~Said maps are hereby adopted by reference as part of these regulations as if the maps were fully described herein~~. **In addition to the Official Zoning Map, the South Dakota Department of Environment and Natural Resources, Division of Financial and Technical Assistance, Geological Survey created a map entitled First Occurrence of Aquifer Materials Map" dated February 13, 2003. This map will be used to further identify aquifer boundaries. In the event of a conflict between such maps as to the area covered by the aquifer at a given location, then the map showing the larger aquifer area shall be followed.**

The Aquifer Protection Overlay District is divided into three zones. The zone of contribution for Zones A and B was mapped by Banner Associates using techniques outlined in the U.S. Environmental Protection Agency publication "Guidelines for Delineation of Wellhead Protection Areas", June, 2000. The shallow/surficial aquifer boundary for Zone C was mapped by the South Dakota Geological Survey.

Section 3.12.03. Zone A – Aquifer Critical Impact Zones.

Zone A, the wellhead protection area, is the mapped zone of contribution around all public water supply wells or wellfields in shallow/surficial aquifers and includes land upgradient from the well or wellfield to the five (5) year time of travel boundary plus any delineated adjacent lands not underlain by the aquifer with sufficient slope that contaminated surface water could flow directly onto Zone A.

Section 3.12.03.01. Permitted Uses in Zone A:

The following uses are permitted provided they meet appropriate performance standards outlined for aquifer protection overlay zones:

1. Agriculture, excluding all classes of new Concentrated Animal Feeding Operations.

2. Horticulture.

3. Parks, greenways or publicly owned recreational areas.
4. Necessary public utilities/facilities designed so as to prevent contamination of groundwater.

5. All uses permitted in the underlying district which do not pose a potential risk to groundwater resources and are not a prohibited use.

Section 3.12.03.02. ~~Special Exception~~ **Conditional Use in Zone A.**

The following uses are permitted only under the terms of a ~~Special Exception~~ **Conditional Use Permit** and must conform to provisions of the underlying zoning district and meet Performance Standards outlined for Aquifer Protection Overlay Zones.

1. Expansion, **modification, alteration, or relocation** of existing **permitted or conditional** uses to the extent they remain or become nonconforming and to the extent allowed by the underlying district. The Board of Adjustment shall not grant approval unless it finds the proposed expansion does not pose greater potential for groundwater contamination than the existing use.

2. ~~All uses not permitted or not prohibited in Zone A may be approved by the Board of Adjustment provided they can meet Performance Standards outlined for the Aquifer Protection Overlay Zones.~~ **Expansion of existing Concentrated Animal Feeding Operations (Existing as of June 30, 1997) not to exceed a cumulative total of three hundred (300) animal units.**

3. All uses permitted by conditional use in the underlying district which do not pose a potential risk to groundwater resources and are not a prohibited use.

Section 3.12.03.03. Prohibited Uses in Zone A.

The following uses are expressly prohibited in Zone A:

1. PR Planned Residential District.

2. New concentrated animal feeding operations of all classes **after July 31, 2001.**

3. Disposal of solid waste except spreading of manure.

4. Outside unenclosed storage of road salt.

5. Disposal of snow containing de-icing chemicals.

6. Processing and storage of PCB contaminated oil.

7. Car washes.

8. Auto service, repair or painting facilities and junk or salvage yards.

9. Disposal of radioactive waste.

10. Graveyards or animal burial sites.

11. Detonation sites, except blasting of rock for farming purposes.
12. Open burning except ditches, fields and non-hazardous yard and household wastes such as paper, wood and leaves.

13. Public sewer systems and wastewater lagoons.

14. Fall application of nitrogen fertilizer except spreading of manure.

15. Land spreading of petroleum contaminated soil.

16. Land spreading or dumping of waste oil.

17. Industrial process water and waste disposal wells--5W20 type Class V injection wells.

18. Automobile service station disposal wells--5X28 type Class V injection wells.

19. All other facilities, **not existing at the time of the adoption of this chapter**, involving the collection, handling, manufacture, use, storage, transfer or disposal of any solid or liquid material or waste having a potentially harmful impact on groundwater quality.

~~20. New Concentrated Animal Feeding Operations after the adoption of these regulations.~~

~~21.~~**20.** Expansion of existing Concentrated Animal Feeding Operations **(Existing as of June 30, 1997)** beyond a **cumulative** total of **three hundred** (300) animal units.

~~22.~~**21.** Earthen storage basins and lagoons.

~~23.~~**22**. Stockpiling of solid waste.

Section 3.12.04. Zone B - Aquifer Secondary Impact Zones

Zone B, the secondary wellhead protection area, is the mapped zone of contribution around all public water supply wells or wellfields in shallow/surficial aquifers and includes land upgradient from the well or wellfield in the five (5) to ten (10) year time of travel boundary plus any delineated adjacent lands not underlain by the aquifer with sufficient slope that contaminated surface water could flow directly onto Zone B.

Section 3.12.04.01. Permitted Uses in Zone B.

The following uses are permitted provided they meet appropriate performance standards outlined for aquifer protection overlay zones:

1. Agriculture, excluding all new Concentrated Animal Feeding Operations ~~which require a special exception permit (New Class 4, and the expansion of existing Class 4 to Class 3).~~

2. Horticulture.

3. Parks, greenways or publicly owned recreational areas.

4. Necessary public utilities/facilities designed so as to prevent contamination of groundwater.

5. All uses permitted in the underlying district which do not pose a potential risk to groundwater resources and are not a prohibited use.

Section 3.12.04.02. ~~Special Exception~~ Conditional Uses in Zone B:

The following uses are permitted only under the terms of a ~~Special Exception~~ **Conditional Use Permit** and must conform to provisions of the underlying zoning district and meet Performance Standards outlined for Aquifer Protection Overlay Zones.

1. Expansion, **modification, alteration, or relocation** of existing **permitted or conditional** uses to the extent they remain or become nonconforming and to the extent allowed by the underlying district. The Board of Adjustment shall not grant approval unless it finds the proposed expansion does not pose greater potential for groundwater contamination than the existing use.

2. ~~New Class 4 and expansion of existing Class 4 up to 999 animal units (Class 3). The County shall require soil borings to determine impermeable material between land surface and the aquifer~~ **Expansion of existing Concentrated Animal Feeding Operations (Existing as of June 30, 1997) not to exceed cumulative total of three hundred (300) animal units.**

3. ~~All other facilities involving the collection, handling, manufacture, use, storage, transfer or disposal of any solid or liquid material or waste having a potentially harmful impact on groundwater quality~~**All uses permitted by conditional use in the underlying district which do not pose a potential risk to groundwater resources and are not a prohibited use**.

4. Earthen storage basins and lagoons.

5. Stockpiling of solid waste.

6. ~~All uses not permitted by Special Exception or prohibited in Zone B~~ **All uses permitted by conditional use in the underlying district which do not pose a potential risk to groundwater resources and are not a prohibited use** may be approved by the Board of Adjustment provided they can meet Performance Standards outlined for the Aquifer Protection Overlay Zones.

Section 3.12.04.03. Prohibited Uses in Zone B.

The following uses are expressly prohibited in Zone B:

1. PR Planned Residential District.

2. New concentrated ~~Class 1, 2, and 3~~ animal feeding operations of all classes **after June 30, 1997**.

3. Disposal of solid waste except spreading of manure.

4. Outside unenclosed storage of road salt.

5. Disposal of snow containing de-icing chemicals;

6. Processing and storage of PCB contaminated oil;

7. Car washes.

8. Auto service, repair or painting facilities and junk or salvage yards.

9. Disposal of radioactive waste.

10. Graveyards or animal burial sites.

11. Detonation sites, except blasting of rock for farming purposes.

12. Open burning except ditches, fields and non-hazardous yard and household wastes such as paper, wood and leaves.

13. Public sewer systems and wastewater lagoons.

14. Fall application of nitrogen fertilizer except spreading of manure.

15. Land spreading of petroleum contaminated soil.

16. Land spreading or dumping of waste oil.

17. Industrial process water and waste disposal wells--5W20 type Class V injection wells.

18. Automobile service station disposal wells--5X28 type Class V injection wells.

19. ~~New Class 4 or expansions existing Class 4 to Class 3 CAFO's which cannot meet performance standards.~~ **Expansion of existing Concentrated Animal Feeding Operations (Existing as of June 30, 1997) beyond a cumulative total of three hundred (300) animal units.**

20. All other facilities, not existing at the time of the adoption of this chapter, involving the collection, handling, manufacture, use, storage, transfer or disposal of any solid or liquid material or waste having a potentially harmful impact on groundwater quality.

Section 3.12.05. Zone C -- Aquifer Tertiary Impact Zones.

Zone C is the remainder of the mapped shallow/surficial aquifer in the County not included in Zone A or Zone B. Zone C is being protected because (1) the aquifer is a valuable natural resource for future development, (2) the aquifer provides drinking water supply for individual domestic users, (3) contamination is not justified just because this area is not currently used for public water supply, and (4) contaminants from this area could eventually enter Zone A or Zone B.

Section 3.12.05.01 Permitted Uses in Zone C.

1. All uses permitted in the underlying zoning districts, with the exception of those prohibited, provided that they can meet the Performance Standards as outlined for the Aquifer Protection Overlay Zones.

Section 3.12.05.02 ~~Special Exception~~ Conditional Use in Zone C.

1. All ~~Special Exception~~ **Conditional Use** allowed in underlying districts, with the exception of those prohibited, may be approved by the Board of Adjustment provided they can meet Performance Standards outlined for the Aquifer Protection Overlay Zones.

2. New Class 4 and expansion of existing Class 4 up to **nine hundred ninety-nine** (999) animal units (Class 3). The County shall require soil borings to determine impermeable material between land surface and the aquifer.

3. Earthen storage basins and lagoons.

Section 3.12.05.03 Prohibited Uses in Zone C.

The following uses are expressly prohibited in Zone C:

1. Fall application of nitrogen fertilizer on lands before October 20th.

2. Land spreading of petroleum contaminated soil.

3. Land spreading or dumping of waste oil.

4. Automobile service station disposal wells--5X28 type Class V injection wells.

5. New Concentrated Animal Feeding Operations of Class 1, Class 2, and Class 3 or expansions **of existing Class 4 concentrated animal feeding operations** which cannot meet performance standards.

Section 3.12.06 Performance Standards for Aquifer Protection Overlay Zones.

The following standards shall apply to land uses in Zones A, B, and C of the Aquifer Protection Overlay Districts:

1. New or replacement septic tanks and associated drain fields for containment of human or animal wastes must conform with regulations established by the South Dakota Department of Environment and Natural Resources.

2. Open liquid waste ponds containing any solid or liquid material or waste will not be permitted without a secondary containment system except for community wastewater lagoons.

3. Storage of petroleum products in quantities exceeding one hundred (100) gallons at one (1) locality in one (1) tank or series of tanks must be in elevated tanks; such tanks larger than eleven hundred (1,100) gallons must have a secondary containment system where it is deemed necessary by the ~~County Zoning Office~~ **Board of Adjustment**.

4. Any commercial or industrial facility, not addressed by #2 or #3 above, involving the collection, handling, manufacture, use, storage, transfer or disposal of any solid or liquid material or waste, except for spreading of manure, in excess of **one thousand** (1,000) pounds and/or **one hundred** (100) gallons which has the potential to contaminate groundwater must have a secondary containment system which is easily inspected and whose purpose is to intercept any leak or discharge from the primary containment vessel or

structure. Underground tanks or buried pipes carrying such materials must have double walls and accessible sumps.

5. Discharge of industrial processed water on site is prohibited without ~~County Zoning Office~~ **Board of Adjustment** approval.

6. Commercial auto service, repair or painting facilities and junk or salvage yards shall meet all State and Federal standards for storage, handling and disposal of all other potentially hazardous waste materials.

7. Any facility involving collection, handling, manufacture, use, storage, transfer or disposal of hazardous materials must prepare and have on file in the County Zoning Office an acceptable contingency plan for preventing hazardous materials from contaminating the shallow/surficial aquifer should floods, fire, other natural catastrophes or equipment failure occur:

   a. For flood control, all underground facilities shall include a monitoring system and a secondary standpipe above the **one hundred** (100)-year frequency flood level. For above ground facilities, an impervious dike, above the **one hundred** (100)-year year flood level and capable of containing **one hundred twenty** percent (120%) of the largest storage volume, will be provided with an overflow recovery catchment area (sump).

   b. For fire control, plans shall include but not be limited to a safe fire fighting procedure, a fire retardant system and provision for dealing safely with both health and technical hazards that may be encountered by disaster control personnel in combating fire. Hazards to be considered are overhead and buried electrical lines, pipes, other buried objects and other hazardous liquids, chemicals or open flames in the immediate vicinity.

   c. For equipment failures, plans shall include but not be limited to:

      i. Below ground level, provision for removal and replacement of leaking parts, a leak detection system with monitoring and an overfill protection system.

      ii. Above ground level, provisions for monitoring, replacement, repair and cleanup of primary containment systems

   d. For other natural or man-caused disasters, the owner and/or operator shall report all incidents involving liquid or chemical material which may endanger health and/or safety of disaster personnel and/or the general public.

   e. Agricultural operations are exempted from performance standard #7 unless chemicals are stored which are on the Superfund Amendments and Reauthorization Act of 1986 (SARA Title III) extremely hazardous substance list in the quantities exceeding the threshold planning quantity at any one time.

   d. The County Zoning Office and DENR shall be informed within **twenty-four** (24) hours of all leaks and spills of materials that might potentially contaminate groundwater.

8. Since it is known that improperly abandoned wells can become a direct conduit for contamination of groundwater by surface water, all abandoned wells should be plugged in conformance with South Dakota Well Construction Standards, Chapter 74:02:04:67-70.

Section 3.12.07 Grant of Permit, Alteration of Use.

Before a permit is granted, the County Zoning Officer must examine an application and determine that the proposed use, activity or development meets the provisions of this ordinance.

When securing a use permit, the owner/developer agrees to make future improvements which may become necessary to prevent contamination of shallow/surficial aquifers and the owner/developer must allow County personnel to inspect any improvements to verify they meet the performance standards.

Whenever any person has an existing use, activity or development and thereafter desires alteration or expansion of the authorized use, such persons shall apply for a permit. The owner may appeal a County Zoning Officer's decision to modify or deny a requested permit to the ~~County~~ Board of Adjustment.

Any lawful use in existence on the effective date of this ordinance shall be permitted to continue provided it can be shown such use does not threaten public health and safety by potential contamination of water in the shallow/surficial aquifer.

Section 3.12.07.01. Exceptions.

1. Storage of liquids, chemicals and fertilizers used in agricultural operations during planting and crop cultivation are exempt from the requirements of this ordinance March 1 to October 1. However, Best Management Practices are encouraged, particularly in Zone A and Zone B.

2. Tanks used for chemigation are exempt from secondary containment regulations but secondary containment is encouraged.

3. Storage of liquid or dry fertilizer in amounts equal to or less than **one thousand** (1,000) pounds or **one hundred** (100) gallons, stored indoors by each farm operator is exempt from the requirements of this ordinance.

Section 3.12.08. Limitation Of County Liability.

Nothing in this ordinance shall be construed to imply that Codington County, by issuing a permit, has accepted any of an owner's/developer's liability if a permitted development contaminates water in shallow/surficial aquifers.

Section 3.12.09. Underlying Zones.

Underlying zoning restrictions apply along with restrictions set forth in the Aquifer Protection Overlay District.

Section 3.12.10. Saving Clause.

Should any section or provision of this ordinance be declared invalid, such decision shall not affect the validity of the ordinance as a whole or any other part thereof.

CHAPTER 3.13. "RR" RURAL RESIDENTIAL DISTRICT.

Section 3.13.01 Purpose

The purpose of this district is to protect a vigorous agricultural industry by limiting the areas in which the "RR" Rural Residential District can be used. The "RR" Rural Residential District is intended to allow the continuation of residential uses which developed with residential density of four or more residences per quarter-quarter section prior to October 22, 2012. The "RR" Rural Residential District is a closed zoning district, therefore the existing platted/legally described lots shall not be subdivided unless and until said property is annexed into the corporate limits of a municipality or appropriately zoned for the proposed subdivision.

Section 3.13.02. Permitted Uses.

1. Site-built single-family non-farm dwelling, including modular homes, and Type A manufactured homes.
2. Public building
3. Farm buildings.
4. Public park and recreation areas.
5. Field crops and grasslands.
6. Orchards, tree farms, botanical gardens (nurseries and greenhouses) – without retail sales.
7. Animal Units on Small Acreages. (See Chapter 5.09)
8. Type 5 Concentrated Animal Feeding Operations (See Chapter 5.21)

Section 3.13.03 Permitted Accessory Uses

The following accessory uses and structures shall be permitted in the "RR" Rural Residential District:

1. Accessory uses and structures customarily incidental to permitted uses and structures when established within the space limit of this district.
2. Home occupation.
3. On-premise signs.

Section 3.13.04. Conditional Uses.

1. Private Wind Energy Conversion Systems. (See Chapter 5.31)

2. Kennels.

3. Religious Institutions and Cemeteries.

4. Assisted living facility

5. Group home

6. Public utility facility

7. Public utility and public service structure including transmission lines, substations, gas regulator stations, pipelines, community equipment buildings, pumping stations, and reservoirs.

8. Bed and breakfast.

9. Wireless Telecommunications Towers and Facilities.

10. Extended home occupation (See Section 5.12).

11. Type B manufactured home

Section 3.13.05 Area Regulations/Easement/Waivers

Minimum lot area, maximum building height, maximum lot coverage and minimum yard requirements shall be regulated in accordance with the following tables:

1.

[redacted]	Minimum Lot Area	Maximum Lot Coverage	Maximum Height (A)	Minimum Lot Width
Permitted Uses (lots less than 35 acres on October 22, 2012)	No minimum (B)(C)(D)	25%	35'	125'
Permitted Uses (lots greater than 35 acres on October 22, 2012)	35 Acres	25%	35'	125'
Other Conditional Uses	To be determined by the Board of Adjustment			

A. *[Exception to maximum height]* The administrative official may allow heights to exceed thirty-five (35) feet for the following:

i. Agricultural buildings.
ii. Water tanks.
iii. Private Wind Energy Conversion Systems (PWECS).
iv. Wireless Telecommunications Towers and Facilities.
v. Others as determined b the Board of Adjustment.

B. No lot shall be decreased in size after October 22, 2012.

C. Any lot created prior to October 26, 1976 shall be considered a single lot, regardless of ownership, for the purposes of this ordinance.

D. Any lot created after October 26, 1976, with less than thirty-five (35) acres as of October 22, 2012 in single ownership with a contiguous lot, shall be considered to be an undivided parcel for the purposes of this ordinance, and no portion of said parcel shall be used or sold in a manner which diminishes compliance with lot width and area requirements established by this ordinance, nor shall any division of any parcel be made which creates a lot with width or area below the total area of the two or more lots on October 22, 2012.

2.

[redacted]	Minimum Front Yard	Minimum Rear Yard	Minimum Side Yard	Minimum Side or Rear Yard Adjacent to A – Agricultural Zoning District
Permitted Uses (A)(B)	50'	25'	15'	25'
Conditional Uses	To be determined by the Board of Adjustment			

A. *[Exception to Setbacks for Nonconforming Structures]*

i. Existing nonconforming residential structures, constructed prior to (Date of Adoption) are eligible to be expanded or added onto, without Board of Adjustment Approval, as long as the existing front, side or rear yard setback(s) is not further encroached upon.

ii.

B. *[Increased Front Yard Setback on Arterial and Township/Section line roads]*

i. The front yard setback on all arterial streets or township maintained section line roads shall be sixty-five (65) feet.

C. Any accessory uses shall be required to comply with the height, front, rear and side yard requirements of the principal building.

3. Agriculture Easement/Waiver:

a. All new residential development (farm and non-farm) shall be required to file an "Agricultural Easement" with the Register of Deeds before the issuance of a building permit. (See Chapter 5.27)

b. Applicants for residential development (farm and non-farm) are required to obtain a written waiver from the owner/operator of any existing concentrated animal feeding operation which is closer than one-half (1/2) mile from the proposed residential building site. If the applicant is unable to obtain the written waiver, he/she shall be required to file a waiver with the Register of Deeds waiving any or all common law challenges to future expansions of the said existing concentrated

animal feeding operation. The waiver is to be filed with the Register of Deeds. (See Chapter 5.29)

4. Access

a. The drive-way serving the parcel shall be separated from adjacent driveways on the same side of the road by the following distances depending upon road types:

v. Local road: 100 feet.

vi. Collector road: 300 feet.

vii. Arterial road: 500 feet.

viii. Minimum distance from intersection of two (2) or more of the above: 100 feet.

b. For all proposed uses and structures adjacent to a State highway, an access permit from the State of South Dakota Department of Transportation shall be required prior to the filing of a plat or the issuance of a building/use permit

ARTICLE IV
ADMINISTRATION

CHAPTER 4.01. GENERAL.

Section 4.01.01. Permits Required.

1. No building or other structure shall be erected, moved, added to, or structurally altered without a permit issued by the Zoning Officer. The Zoning Officer except in conformity with the provisions of this ordinance shall issue no permit, unless he received a written order from the Board of Adjustment in the form of an administrative review, under conditional use, or variance as provided by this ordinance.

2. It shall be unlawful to commence the excavation for the construction of any building or any accessory building without a permit. A permit is also required for any filling, grading, lagooning, or dredging which is related to site preparation for future construction.

Section 4.01.02. Applications.

1. All applications for permits shall be accompanied by a site plan drawn to scale, showing the actual dimensions and shape of the lot to be built upon; the exact sizes and locations on the lot of the buildings already existing, if any; and the location and dimensions of the proposed building or alteration. The application shall include such other information as lawfully may be required by the Zoning Officer, including legal description, existing or proposed buildings or alterations; existing or proposed uses of the building and land; the number of families, housekeeping units, or rental units the building is designed to accommodate; conditions existing on the lot; existing or proposed water, sewer, electrical facilities; and such other matters as may be necessary to determine conformity with, and provide for the enforcement of, this ordinance. Such plans and data accompanying the permit shall be final and conclusive. Deviations shall be deemed a violation of this Ordinance, and punishable as provided in 1.02.03.

Section 4.01.03. Building/Use Permit.

1. Issuance of a Building/Use Permit. If the proposed excavation or construction as set forth in the application are in conformity with the provisions of this Ordinance, and other regulations of the County then in force, the Zoning Officer shall issue a building/use permit for such excavation or construction. If a building/use permit is refused, the Zoning Officer shall provide the applicant notice, verbally or by mail, of such refusal with the cause for denial. The Zoning Officer shall grant or deny the permit within a reasonable time from the date the application is submitted.

2. The issuance of a building/use permit shall, in no case, be construed as waiving any provisions of this Ordinance. If the work described in any building permit has not been substantially completed within six (6) months of the date of issuance thereof, said permit shall expire and be cancelled by the Zoning Officer and written notice thereof shall be given to the persons affected, together with notice that further work as described in the canceled permit shall not proceed unless and until a new building/use permit has been issued. If substantial progress has been made within

six (6) months from the issuance of the permit but has not been completed, the Zoning Officer may extend the building/use permit and additional six (6) months.

Section 4.01.04. Permits Displayed.

1. Permits Displayed. It shall be unlawful to commence work until the building permit is displayed in a conspicuous place visible from public right-of-way. The permit shall be placed upon the premises at all times from the beginning until the completion of such construction, alteration, repair, occupancy or change of use.

Section 4.01.05. Fees.

1. The Board of County Commissioners shall, by resolution, establish a schedule of fees, charges, and expenses and a collection procedure for building permits, certificates of zoning compliance, appeals, and other matters pertaining to this Ordinance, The schedule of fees shall be posted in the office of the Zoning Officer and may be altered or amended only by the Board of County Commissioners.

2. Until all applicable fees, charges, and expenses have been paid in full, no action shall be taken on any application or appeal.

CHAPTER 4.02. ZONING OFFICER.

Section 4.02.01. Zoning Officer.

1. The provisions of this Ordinance shall be administered and enforced by a County Zoning Officer appointed by the Board of County Commissioners, who shall have the power to make inspection of buildings or premises necessary to carry out his duties in the enforcement of this Ordinance.

Section 4.02.02. Duties.

The powers and duties of the Zoning Officer shall be as follows:

1. Issue all building/use permits and make and maintain records thereof.

2. Conduct inspections of buildings, structures, and the use of land to determine compliance with this Ordinance.

3. Notify in writing persons responsible for violations, indicating the nature of the violation and ordering action necessary to correct.

4. Order discontinuance of illegal use of land, buildings, or structures; removal of illegal buildings or structures or of illegal additions; alterations or structural changes; discontinuance of any illegal work being done; or shall take any other action authorized by this Ordinance to ensure compliance with or to prevent violation of its provisions.

5. Revoke any permit, which was unlawfully issued, or any permit wherein defective work has been performed, and when such work has not been corrected within ninety (90) days of notification.

6. Maintain permanent and current records of this regulation, including, but not limited to, all maps, amendments, variances, appeals, and applications.

7. Prepare documents, easements, letters of assurance, waivers, etc. as required by this Ordinance, or at the direction of the Codington County Planning Commission and/or the Codington County Board of Adjustment and/or Codington County Commissioners.

8. Provide public information relative to all matters arising out of this Ordinance.

9. Forward to the Planning Commission all plats and/or applications for amendments to this Ordinance.

10. Forward to the Board of Adjustment, applications for appeals, conditional uses, variances, or other matters on which the Board of Adjustment is required to pass under this ordinance.

11. Initiate, direct, and review, from time to time, a study of the provisions of this ordinance, and to make such reports available to the Planning Commission.

12. The Zoning Officer shall receive applications required under this ordinance, specifically but not limited to Building Permits, Conditional Uses, Variances, and Zoning Amendments.

    a. For building permits, the Zoning Officer shall approve the application only in accordance with the provisions of the County's Zoning Ordinance.

    b. For Conditional Uses and Variances, the Zoning Officer shall review the application, and shall make recommendations regarding said application to the Board of Adjustment.

    c. For Zoning Amendments, the Zoning Officer shall review the application, and shall make recommendations regarding said application to the Planning Commission and Board of County Commissioners.

Section 4.02.03. Right of Entry.

Whenever necessary to make an inspection to enforce any of the provisions of this regulation, or whenever the Zoning Officer or an authorized representative has reasonable cause to believe that there exists in any building or upon any premises a regulation violation, the Zoning Officer or an authorized representative may enter such building or premises at all reasonable times to inspect the same or to perform any duty imposed upon the Zoning Officer by this ordinance, provided that if such building or premises be occupied, they shall first present proper credentials and request entry; and if such building or premises be unoccupied, they shall first make a reasonable effort to locate the owner or other persons having charge or control of the building or premises and request entry. If such entry is refused, the Zoning Officer or an authorized representative shall have recourse to every remedy provided by law to secure entry.

When the Zoning Officer or an authorized representative shall have first obtained a proper inspection warrant or other remedy provided by law to secure entry, no owner or occupant or any other persons having charge, care or control of any building or

premises shall fail or neglect, after proper request is made as herein provided, to promptly permit entry therein by the Zoning Officer or an authorized representative for the purpose of inspection and examination pursuant to this regulation.

Section 4.02.04. Stop Order

Whenever any work is being done contrary to the provisions of this ordinance, the Zoning Officer may order the work stopped by notice in writing served on any persons engaged in the doing or causing such work to be done, and any such persons shall forthwith stop such work until authorized by the Zoning Officer to proceed with the work.

Section 4.02.05. Occupancy Violation.

Whenever any building or structure regulated by this ordinance is being used contrary to the provisions of this ordinance, the Zoning Officer may order such use discontinued and the structure, or portion thereof, vacated by notice served on any person causing such use to be continued. Such persons shall discontinue the use within the time prescribed after receipt of such notice to make the structure, or portion thereof, comply with the requirements of this ordinance.

CHAPTER 4.03. PLANNING COMMISSION.

Section 4.03.01. Establishment.

1. **The Board of County Commissioners shall appoint a Planning Commission of seven (7) members, at least one (1) member of which shall be a member of the Board of County Commissioners.**

Section 4.03.02. Term of Office.

1. **The term of each of the appointed members of the County Planning Commission shall be for four (4) years. The terms shall be varied so no more than one-third of terms shall expire in the same year. Any appointed member of the county Planning Commission may be removed for cause, after hearing prior to the expiration of the term by a majority vote of the elected members of the Board of County Commissioners. Zoning Officers of the County may be appointed as ex-officio members of the Commission.**

Section 4.03.03. Meetings of the Planning Commission

1. **The Planning Commission shall meet at such times as may be necessary to accomplish the purposes of their duties, but in no event shall they meet less than once every three (3) months.**

Section 4.03.04. PerDiem and Expenses of Commission

1. **Per diem and expenses of the County Planning Commission shall be established by the Board of County Commissioners and paid by the County.**

CHAPTER 4.04. BOARD OF ADJUSTMENT.

Section 4.04.01 Establishment

Within Codington County outside of incorporated municipalities, the power and jurisdiction related to this article shall be executed by the Board of Adjustment.

1. The Board of Codington County Commissioners shall appoint the Codington County Planning Commission and two (2) alternates to act as the Board of Adjustment. If a Planning Commissioner acting as a Board of Adjustment member is unable to attend a meeting, the first alternate, or second alternate, in turn, shall serve in the member's place. Alternates may be appointed for a term of three (3) years.

Section 4.04.02. Procedures for Meetings.

1. The Board of Adjustment shall adopt rules necessary to the conduct of its affairs and in keeping with the provisions of this Ordinance. Meetings shall be held at the call of the chairman and at such other times as the Board of Adjustment may determine. The chairman, or in his absence the acting chairman, may administer oaths and compel the attendance of witnesses. All meetings shall be open to the public.

2. The Board of Adjustment shall keep minutes of its proceedings and shall keep records of its examinations and other official actions, all of which shall be immediately filed in the office of the Zoning Officer and shall be public record. The Board of Adjustment shall keep record in the minutes showing the vote of each member upon each question or if absent or failing to vote, indicating that fact.

Section 4.04.03. Powers and Duties of the Board.

1. The Board of Adjustment shall have the following powers and duties:

   a. Administrative Review. To hear and decide where it is alleged by the appellant that there is error in any order, requirement, permit decision, determination or refusal made by the Zoning Officer or other administrative officers in the carrying out or enforcement of any provision of this Ordinance, and for interpretation of the Zoning Map.

   b. Conditional Uses. To hear and decide applications for conditional uses that are specified in this Ordinance and for decisions on any special questions upon which the Board of Adjustment is specifically authorized to pass.

   c. Variance. To hear and decide applications for variance from the terms of this Ordinance because of unnecessary hardship and to authorize upon appeal in specific cases such variance from the terms of this Ordinance as which will not be contrary to the public interest where, owing to special conditions, a literal enforcement of the provisions of this Ordinance would result in unnecessary hardship.

Section 4.04.04. Power and Jurisdiction Relating to Administrative Review.

The Board of Adjustment shall have the power to hear and decide appeals where it is alleged there is error in any order, requirement, decision or determination made by an Zoning Officer or agency based on or made in the enforcement of any zoning regulation or any regulation relating to the location of structures or to interpret any map.

Section 4.04.05. Board of Adjustment has Powers of Administrative Officer on Appeals: Reversing Decision of Zoning Officer.

1. **In exercising the above-mentioned powers, the Board of Adjustment may reverse or affirm, wholly or partly, or may modify the order, requirement, decision or determination appeal from, and may make such order, requirement, decision or determination as ought to be made, and to that end shall have all the powers of the Zoning Officer from whom the appeal is taken.**

2. **The concurring vote of two-thirds (2/3) of all members of the Board of Adjustment (five (5) votes) shall be necessary to reverse any order, requirement, decision, or determination of the Zoning Officer, or to decide in favor of the applicant on any matter upon which it is required to pass under this ordinance, or to effect any variation in the application of this ordinance.**

Section 4.04.06. Appeals, Record of Appeal, Hearing and Stays

1. **It is the intent of this Ordinance that all questions of interpretation and enforcement shall be first presented to the Zoning Officer, and that such questions shall be presented to the Board of Adjustment only on appeal from the decision of the Zoning Officer.**

2. **Appeals to the Board of Adjustment may be taken by any person aggrieved or by an officer, department, board or bureau of the County affected by any decision of the zoning officer. The applicant shall file with the Zoning Officer a notice of appeal specifying the grounds thereof. The Zoning Officer shall forthwith transmit to the Board of Adjustment all papers constituting the record upon which the action appealed from was taken. Such appeal shall be taken within thirty (30) days.**

3. **An appeal stays all proceedings in furtherance of the action appealed from, unless the Zoning Officer from whom the appeal is taken certifies to the Board of Adjustment after the notice of appeal shall have been filed with him, that by reason of facts stated in the certificate a stay would, in his opinion, cause imminent peril to life or property.**

4. **In such case, proceedings shall not be stayed otherwise than by a restraining order which may be granted by the Board of Adjustment or by a court of record on application on notice to the office from whom the appeal is taken and on due cause shown.**

5. **The Board of Adjustment shall hear and decide, on not less than ten (10) days public notice prior to an affixed time and place for hearing appeals where it is alleged by the appellant that there is error in any order, requirement, permit decision, determination or refusal made by the Zoning Officer or other administrative officers in carrying out**

the enforcement of any provision of this Ordinance, and for interpretation of the Zoning Map. At the hearing, any party may appear in person or by agent or attorney.

Section 4.04.07. Duties Of Zoning Officer, Board Of County Commissioners, and Courts On Matters Of Appeal.

It is the intent of this Ordinance that all questions of interpretation and enforcement shall be first presented to the Zoning Officer, and that such questions shall be presented to the Board of Adjustment only on appeal from the decision of the Zoning Officer, and that recourse from the decision of the Board of Adjustment shall be to the courts as provided by the laws of the State of South Dakota.

Section 4.04.08. Appeals to a Court of Record.

Any person or persons, jointly or severally, aggrieved by any decision of the board of adjustment, or any taxpayer, or any officer, department, board, or bureau of the county, may present to a court of record a petition duly verified, setting forth that the decision is illegal, in whole or in part, specifying the grounds of the illegality. The petition shall be presented to the court within thirty (30) days after the filing of the decision in the office of the Board of Adjustment.

CHAPTER 4.05. PROCEDURES FOR CONDITIONAL USES, VARIANCES, AND ZONING AMENDMENTS.

Section 4.05.01. Powers and Jurisdiction Relating to Conditional Uses.

The Board of Adjustment shall have the power to hear and decide, in accordance with the provisions of this Ordinance, requests for conditional uses or for decisions upon other special questions upon which the Board of Adjustment is authorized by this Ordinance to pass; to decide such questions as are involved in determining whether special conditions and safeguards as are appropriate under this Ordinance, or to deny conditional uses when not in harmony with the purpose and intent of this Ordinance. A conditional use shall not be granted by the Board of Adjustment unless and until:

1. A written application for a conditional use is submitted, indicating the section of this Ordinance under which the conditional use is sought and stating the grounds on which it is requested.

2. The Zoning Officer shall require the applicant for a conditional use permit to notify adjacent property owners by certified or registered mail, at the cost of the applicant, of the conditional use permit or in lieu of this, at the discretion of the Zoning Officer, obtain written consent from adjacent landowners.

3. Notice of hearing shall be published once, ten (10) days prior to the Board of Adjustment public hearing, in a paper of general circulation in the area affected.

4. The public hearing shall be held. Any party may appear in person, or by agent or attorney.

5. The Board of Adjustment shall make a finding that it is empowered under the section of this Ordinance described in the application to grant the conditional use, and that the granting of the conditional use will not adversely affect the public interest.

6. Before granting any conditional use, the Board of Adjustment shall make written findings certifying compliance with the specific rules governing individual conditional uses and that satisfactory provision and arrangements have been made concerning the following, where applicable:

   a. Entrance and exit to property and proposed structures thereon with particular reference to automotive and pedestrian safety and convenience, traffic flow and control, and access in case of fire or catastrophe.

   b. Off-street parking and loading areas where required, with particular attention to the items in (a) above and the economic, noise, glare or other effects of the conditional use on adjoining properties and properties generally in the district.

   c. Utilities refuse and service areas, with reference to locations, availability, and compatibility.

   d. Screening and buffering with reference to type, dimensions and character.

   e. Signs, if any, and proposed exterior lighting with reference to glare, traffic safety, economic effect and compatibility and harmony with properties in the district.

   f. Required yards and other open space.

   g. General compatibility with adjacent properties and other property in the district.

7. In granting any conditional use, the Board of Adjustment may prescribe appropriate conditions and safeguards in conformity with this regulation. Violation of such conditions and safeguards, when made a part of the terms under which the variance is granted, shall be deemed a violation of this regulation and punishable under the terms of this regulation

8. The concurring vote of five (5) members of the Board of Adjustment is required to pass any application for a Conditional Use.

9. A conditional use permit shall expire one (1) year from the date upon which it becomes effective if no work has commenced. Upon written request to the Board of Adjustment and prior to the conditional use permit expiration date, a one (1) year time extension for the conditional use may be granted by the Board of Adjustment.

Section 4.05.02. Powers and Jurisdiction Relating to Variances.

The Board of Adjustment shall have the power, where, by reason of exception, narrowness, shallowness or shape of a specific piece of property at the time of the enactment of this Ordinance, or by reason of exceptional topographic conditions or other extraordinary and exceptional situation or condition of such piece of property, the strict application of any regulation under this Ordinance would result in peculiar and exceptional practical difficulties to, or exceptional and undue hardships upon, the owner of such property, to authorize, upon an appeal relating to the property, a variance from such strict application so as to relieve such difficulties or hardship, if such relief may be granted without substantially impairing the intent and purpose of this Ordinance. A variance shall not be granted by the Board of Adjustment unless and until:

1. A written application for a variance is submitted, indicating the section of this Ordinance under which the variance is sought and stating the grounds on which it is requested.

2. The Zoning Officer may require the applicant for a variance to notify adjacent property owners by certified or registered mail, at the expense of the applicant, of the variance request or in lieu of this, at the discretion of the Zoning Officer, obtain written consent from adjacent landowners.

3. Notice of hearing shall be published once, ten (10) days prior to the Board of Adjustment public hearing, in a paper of general circulation in the area affected.

4. The public hearing shall be held. Any party may appear in person, or by agent or attorney.

5. The Board of Adjustment shall make a finding that it is empowered under the section of this Ordinance described in the application to grant the variance, and that the granting of the variance will not adversely affect the public interest. A variance from the terms of this ordinance shall not be granted if the following occur:

   a. There are no special conditions and circumstances exist which are peculiar to the land, structure or building involved, and which are applicable to other land, structures, or buildings in the same district;

   b. The literal interpretation of the provisions of this ordinance would not deprive the applicant of rights commonly enjoyed by other properties in the same district under the terms of this ordinance;

   c. The special conditions and circumstances do result from the actions of the applicant;

   d. Financial disadvantage of the property owner shall not constitute conclusive proof of unnecessary hardship within the purposes of zoning.

   e. The granting the variance request would confer on the applicant any special privilege that is denied by this ordinance to other lands, structures, or buildings in the same district.

   f. No nonconforming use of neighboring lands, structures, or buildings in the same district, and no permitted or nonconforming use of lands, structures, or buildings in other districts shall be considered grounds for the issuance of a variance.

6. In granting any variance, the Board of Adjustment may prescribe appropriate conditions and safeguards in conformity with this regulation. Violation of such conditions and safeguards, when made a part of the terms under which the variance is granted, shall be deemed a violation of this regulation and punishable under the terms of this regulation.

7. Under no circumstances shall the Board of Adjustment grant a variance to allow a use not permissible under the terms of this regulation in the district involved, or any use expressly or by implication prohibited by the terms of this regulation in said district.

8. The concurring vote of five (5) members of the Board of Adjustment is required to pass any application for a variance.

Section 4.05.03. Zoning Amendments.

Whenever the public necessity, safety, and general welfare or good zoning practices justifies such action, and after consideration and recommendation by the Planning Commission, as provided herein, the Board of County Commissioners may change zoning district boundaries, use groups, or the regulations established by this ordinance. A proposed change of zoning district boundaries or regulations may be initiated by the Board of County Commissioners, the Planning Commission, or by application of one (1) or more of the owners of property within the area requested to be rezoned. Initiated petitions which create amendments to this ordinance are required to submit signatures of thirty (30) percent of the landowners in the zoning district or districts requesting change. Unless otherwise provided for in these regulations, any change in these regulations, shall require Board of County Commissioners approval of an ordinance describing said changes. The Board of County Commissioners may not consider said ordinance until the Planning Commission has delivered a recommendation to either approve or not approve said ordinance amendment.

The following procedure for requesting a Zoning Amendment or Zoning District Boundary Change shall be followed:

4. The landowner or other person(s) requesting the Amendment/Boundary change shall complete an application, available from the Zoning Officer. Completed applications shall be returned to the Zoning Officer for review. To be considered by the Planning Commission and Board of County Commissioners, the application form shall be completed and shall be accompanied by the following items:

   a. Any required attachments and fees, including Registered or Certified Mail.

   b. Any additional information, as requested by the Zoning Officer, as lawfully may be required to determine conformance with and provide for enforcement of this ordinance.

   c. The Zoning Officer shall review the application, and shall forward a summary of the application, and his/her comments regarding said application, to the Planning Commission for their review.

   d. The Zoning Officer shall set the date, time, and place for public hearings to be held by the Planning Commission and Board of County Commissioners. The Zoning Officer shall publish notice of the public hearing in a newspaper of general circulation in the area affected by the proposed amendment; such notice shall be published not less than ten (10) days prior to each board's (Planning and Zoning, Board of County Commissioners) public hearing. If the proposed amendment will change the boundaries of a zoning district, the Zoning Officer shall notify all owners of property within two hundred fifty (250) feet of the proposed boundary change, by Registered or Certified Mail at the expense of the applicant, at least one (1) week before the public hearing.

e. The public hearing shall be held. Any person may appear in person, or by agent or attorney. Minutes of the public hearing shall be recorded and kept in the records of the Planning Commission.

f. The Planning Commission shall either recommend or denial of the amendment to the Board of County Commissioners.

g. Adoption. Amendments to the zoning ordinance may be adopted by a majority vote unless the amendment has been denied by the Planning Commission in which case a two-thirds (2/3) vote of the Board of Codington County Commissioners is required.

h. When the Board of County Commissioners approves a proposed amendment affecting the zoning classification of property, affected property owners may file a written protest to stop such an amendment from taking effect. If the protest meets the following standard, such amendment shall not become effective unless the amendment is approved by two-thirds (4 votes) of the Board of County Commissioners.

   i. Protest Standard: The protest shall be signed by at least 40% of the owners of equity in the parcels in the area affected by the amendment, and the parcels or parts of parcels within 250 feet of the area affected by the amendment.

i. After passage the Ordinance Amendment shall take effect on the 20th day after its publication in an official newspaper of the County.

Section 4.05.04. Reapplication.

No application requesting a variance, conditional use, or zoning ordinance amendment or district classification change on any property whose application includes any such property either entirely or substantially the same as that which has been denied by the Board of Adjustment (variances, conditional uses) or Board of County Commissioners (Zoning Amendments, Zoning District Boundary Changes), shall again be considered by the Planning Commission, Board of Adjustment or Board of County Commissioners before the expiration of six (6) months from the date of the final action of the Planning Commission, Board of Adjustment, or Board of County Commissioners.

~~SECTION~~ ARTICLE V
GENERAL REQUIREMENTS

Pursuant to the purpose of this Regulation are certain general requirements that are not provided for under ~~Section IV~~ **Article III** District ~~Requirements~~ **Regulations**. These requirements are set forth under this Section.

~~5.1 RESERVED~~ CHAPTER 5. 0~~2~~1. VISION CLEARANCE ON CORNER LOTS.

On any corner **lot in any zoning district**, no **planting,** ~~no fence, building, other~~ structure, ~~shelterbelt, hedge, tree, bush~~, or ~~other object~~ **obstruction to vision between the range of three (3) and eight (8) feet in height measured from the center line of the road shall be placed or maintained within the triangular area formed by the intersection road right-of-way lines and a straight line connecting points on said road right-of-way line each of which is one hundred (100) feet distance from the point of intersection (Clear View Triangle). Exception: In the Lake Park District, Town District, and Planned Residential District, the Clear View Triangle shall be formed by the intersection road right-of-way lines and a straight line connecting points on said road right-of-way line each of which is fifty (50) feet distance from the point of intersection.**

CHAPTER 5.0~~3~~2. REFUSE.

In all Zoning Districts, refuse (rubbish, garbage, trash, waste or debris) shall be kept within a completely enclosed building or specially designed closed container made for such purpose. Owners of vacant lots shall be responsible for keeping their property free of trash. Normal farming operations excluded.

CHAPTER 5.043. UNLICENSED VEHICLES.

Vehicles not in use and without a current license may not be kept in any uncovered area other than a designated junk or salvage yard **or designated collection site**.

CHAPTER 5.0~~5~~4. SALE OF PARKING AREAS.

Off-street parking areas required under ~~Section IV~~ **Article III** District ~~Requirements~~ **Regulations**, as part of lot requirements may not be separated from the property of which it was an original part.

~~5.6 NON-CONFORMING USE~~

~~A. Any non-conforming building or land existing at the time of the passage of this Regulation may be continued even though such building, structure, or land use does not conform with the provisions of this Regulation for the District in which it is located. Any such existing non-conforming use may hereafter be extended throughout any part or parts of a building which were manifestly arranged or designed for such use at the time of passage of this Regulation. Any such existing non-conforming land use may be expanded throughout any contiguous land area under the same ownership at the time of the adoption of this Regulation except when such non-conforming land use by its expansion enters into an area with a different zoning classification.~~

~~B. No non-conforming use, building, structure, or premises, if once changed to conform to the requirements of this Regulation for the District in which it is located, shall ever be changed back so as to be non-conforming. No non-conforming use which shall have been discontinued for a period exceeding twelve (12) months shall be resumed or replaced by any other non-conforming use.~~

~~C. Nothing in this Regulation shall prevent the restoration of any wall or other portion of a building declared unsafe by an authorized public official.~~

~~D. Whenever any building existing in any of the districts as a non-conformity is condemned by an authorized public official, it cannot be rebuilt for a non-conforming use. If any non-conforming building is destroyed or damaged by any casualty, such building may be repaired or replaced and use continued providing said reconstruction shall not add to the non conformity or add to the cubic contents of said building as the same existed at the time of such casualty; and provided further than such repair or reconstruction of such building shall be begun within six (6) months after such casualty and completed within a reasonable time thereafter; however, if the damage caused by such casualty is such as to cause a loss in value exceeding sixty percent (60%) of the value immediately prior to such casualty, then it cannot be rebuilt for a non-conforming use. The loss in value shall be computed as the difference between the actual cash value of the structure immediately before and after the casualty. Cash value shall be the same as that used for insurance purposes as approved by the State of South Dakota Insurance Code.~~

~~E. The foregoing provision of this Section shall apply to buildings, structures, land or uses, except those buildings, land or uses which are agricultural in nature which may hereafter become non-conforming by reason for the rezoning of the area in which the same may be situated.~~

~~F. Nothing contained in this Section shall be so construed as to abridge or curtail the powers of the County Planning Commission as set forth elsewhere in this Regulation.~~

~~G. Any area proposed or being developed for residential use in the "A" Agricultural Land District must provide for a minimum of thirty five (35) acres per lot, unless platted prior to the adoption of this Regulation. Exception to the lot size may be made according to Section IV (4.1)(C) 6 of this Regulation.~~

~~H. All structures used for human habitation or commercial use must be connected to a sewage disposal system approved by the zoning commission. If a public sewer is available, all such structures must be connected.~~

CHAPTER 5.05. SCREENING.

Where any commercial or industrial use is adjacent to any residential use, that use (building, parking or storage) shall be appropriately screened from the residential use by a fence or planting, approved by the Board of Adjustment, except where such fence or planting may be in conflict with vision clearance.

CHAPTER 5.~~7~~06. MOVED IN BUILDINGS

1. ~~Any building, except those covered under Section 8.1 moved into any use district must secure a special permit from the Zoning Officer.~~ **It shall be unlawful to move any house or other building onto any lot or to any new location within the County unless and until a permit to do so has been obtained from the Zoning Officer. No permit shall be issued until the following requirements are met.**

   a. The fee for said permit as prescribed in Section 4.01.05, shall have been paid.

   b. That the work is to be completed within six (6) months after the permit has been issued by the Zoning Officer.

   c. Must have signatures, by petition, of ~~one hundred~~ ~~(100%)~~ **sixty-six percent (66%)** of the adjoining landowners, including land directly across a road or highway, and ~~one hundred~~ ~~(100%)~~ **fifty percent (50%**) of landowners within two hundred (200) feet. EXCEPTION: A new residence to be used for first occupancy, constructed off the property and moved to location, shall not require adjoining landowners' approval.

~~C. Type A manufactured homes are exempt from the requirements of 5.7 B; Type B and Type C must meet the requirements of 5.7 B, except that a manufactured home located on adjoining property shall be considered consent.~~

~~D. Nothing contained in this Regulation shall prevent a single permanent manufactured home from being placed on an established farmstead, to be used as a secondary residence, so long as it is immediately connected to the existing farm operation and its occupant is also engaged in that farming operation.~~

CHAPTER 5.~~8~~07. MINIMUM WATER AND SEWER REQUIREMENTS.

A water and sewer system cannot be approved until it meets the following standards:

1. All subsurface absorption systems shall be at least one hundred (100) feet from any water supply well, eighty (80) feet from any lake, stream, or water course, and twenty-five (25) feet from property lines.

2. The bottom of the drain area or tile field should be at least four (4) feet above the maximum high ground water level and five (5) feet above rock or impervious soil strata and not more than five (5) feet below ground surface.

3. All structures used for human habitation or commercial or industrial use must be connected to a sewage disposal system which meets South Dakota Department of Environment and Natural Resources Administrative Rules and be approved by the Zoning Officer. If a public sewer is available, all such structures must be connected to said public sewer.

CHAPTER 5.~~9~~ 08. SHELTERBELT SETBACK REQUIREMENTS.

1. A shelterbelt, consisting of one (1) or more rows, shall not be established within one hundred fifty (150) feet of a public road right-of-way ~~line~~ on the north and west sides of roads and not within one hundred (100) feet of a public road right-of-way ~~line~~ on the south and east sides of roads. **Exception: A shelterbelt, consisting of one (1) or more rows, may be established on the north and west sides of a road with the north or west windward row to be located at least one hundred fifty (150) feet from a public road right-of-way and the north or west non-windward row to be located no closer than seventy-five (75) feet from a public road right-of-way; or a shelterbelt, consisting of one (1) or more rows, may be established on the south and east sides of a road with the south and east windward row to be located at least one hundred (100) feet from a public road right-of-way and the south and east non-windward row to be located no closer than fifty (50) feet from a public road right-of-way if there is an existing shelterbelt within one-half (1/2) mile and parallel to the north or west of the proposed shelterbelt. The exception(s) is also subject to 5.08.4. The windward row of trees shall consist of shrubbery or tree species, as determined by the State Urban Forester, which aid in the containment of snow.** Shelterbelts at right angles to roads shall have a minimum turnaround of fifty (50) feet measured from the road right-of-way. Shelterbelts shall not be established within one hundred fifty (150) feet of adjoining property lines without written permission of adjoining property owners.

2. **Shade Trees, ornamental trees or shrubs generally used in front yards for landscaping and spaced further than fifteen (15) feet apart and further do not extend lineally for a distance of over one hundred fifty (150), are not considered shelterbelts and are allowed in a controlled area. The controlled area is defined as the area within one hundred (100) feet of homes or farm buildings, but not closer to the right-of-way than fifty (50) feet. Except for the following, plantings within the controlled area are exempt from this regulation. Four (4) or more trees planted in a row are not allowed with the controlled area. Deciduous trees which are spotted or staggered within the controlled area can be no closer than twenty (20) feet. Conifer trees which are spotted or staggered within the controlled area can be no closer than twenty-five (25) feet. The distance between trees shall be determined by measuring distance between tree trunks.**

3. **The shelterbelts setback requirements (paragraph 1) also apply to volunteer trees that the landowner allows to grow.**

4. **A recommendation from the County Highway Superintendent, Township and/or State Department of Transportation is required prior to the issuance of any variance of the shelterbelt setback from any respective County, Township or State/Federal public right-of-way.**

CHAPTER 5.~~1~~09. ANIMAL UNITS ON SMALL ACREAGES.

On parcels of land of ten (10) acres or less, a maximum of one (1) animal unit per acre will be allowed. Designated ~~commercial feedlots~~ **concentrated animal feeding operations** excluded.

CHAPTER 5.1~~1~~0. MANUFACTURED HOME PARKS.

It shall be unlawful for any person to place or maintain a manufactured home park in the unincorporated area of Codington County unless said court is connected to an approved public water and sewer system. **Exception, A manufactured home park existing prior to June 18, 1974 may be allowed in a commercial zoning district subject to meeting the following requirements:**

Section 5.10.01 Manufactured Home Parks Minimum Standards.

1. The existing manufactured home park shall provide a map showing:

- **a. Location and topography of the manufactured home park, including adjacent proximity to Federal and State highways, and County, Township, and City roads/streets.**
- **b. Property lines and square footage of the proposed park.**
- **c. Location and dimension of all manufactured home rental lots.**
- **d. Location of all structures on said manufactured home rental lots with special attention to setback from streets and other structures.**
- **e. Age of all manufactured homes on said manufactured home rental lots.**
- **f. Location and dimensions of all easements and rights-of-way.**
- **g. Proposed general layout, including parking and recreation areas.**
- **h. General street and pedestrian walkway plan.**
- **i. General utility, water, and sewer plan.**

2. The existing manufactured home park shall provide a mitigation plan addressing the following:

- **a. Streets - Each manufactured home lot shall abut or face a public or private roadway or street. The street shall be in good repair and the manufactured home park owner shall present a plan on how and when the roads are to be maintained.**
- **b. Lot area - Each lot provided for the occupancy of a single manufactured home unit shall be not less than fifty (50) feet in width and have an area of not less than five thousand five hundred (5,500) square feet, and the same shall be defined by markers at each corner.**
- **c. Density – No existing manufactured home park shall be permitted to increase the density of manufactured home lots existing at the time of issuance of conditional use permit.**
- **d. Spacing and Yard Requirements - All subsequent manufactured housing units positioned on defined rental lots will comply with the following:**
  - **i. Front Yard - All manufactured homes shall be located at least twenty (20) feet from any road or street. The distance will be measured from the wall of the structure to the street or roadway at the closest point.**
  - **ii. Side and Rear Yards - All manufactured homes shall have minimum side yards of seven (7) feet and a minimum rear yard of ten (10) feet.**
  - **iii. Exceptions to Minimum Yard Requirements - A garage, canopy, or carport may project into a required side or rear yard provided it is located no closer than ten (10) feet to another manufactured home, garage, canopy, carport, or addition thereto, and provided further that the maximum depth be twenty-four (24) feet.**

A deck may project into a required side or rear yard provided it is located no closer than four (4) feet to any other structures.
An enclosed vestibule containing not more than forty (40) square feet in area may project into a required yard for a distance not to exceed four (4) feet, but in no event closer than ten (10) feet to another manufactured home, garage, canopy, carport, or addition thereto.
Detached accessory buildings with a projected room area of not more than one hundred and twenty (120) square feet may project into a required side or rear yard provided it is located no closer than four (4) feet to another structure or right-of-way.

e. Parking -Two (2) off-street automobile parking spaces shall be provided for each manufactured home. Such off-street parking spaces shall be set-aside in a location convenient to the occupants.
f. Refuse Collection - One refuse collection station shall be provided, with a minimum of one (1) two-yard dumpster situated on a concrete pad, for each twelve (12) families or fractions thereof, conveniently located to serve tenants, not less than one hundred (100) feet from any manufactured home unit served, and to be conveniently located for collection.
g. On-Site Management - Each manufactured home park shall provide management by the owner or his representative at all times to supervise the management, repairs, maintenance and janitorial work connected therewith and to see that all provisions of this Chapter are complied with.
h. Tie Down Requirements - All manufactured homes placed after the adoption of this ordinance, regardless of location, unless such manufactured homes are securely anchored to a permanent foundation approved by the Zoning Officer, shall be anchored to the ground, in accordance with the manufacturer's specifications or as prescribed by the TR-75, issued June 1972 by the U.S. Department of Defense.
i. Maximum Age Limitation - No manufactured home placed within a manufactured home park may exceed fifteen (15) years from the date of manufacture. The Board of Adjustment may grant a variance from the maximum age requirement subject to the applicant meeting the following requirements:

   i. The applicant shall provide a photograph of the manufactured home's exterior and interior.
   ii. That it shall have been shown to the satisfaction of the Zoning Officer that the said manufactured home complies with the recognized gas, plumbing, electrical, and construction standards.
   iii. A majority of adjoining residences (excluding streets) do no object to the placement of the manufactured home.

j. Skirting - All manufactured homes, regardless of location, unless such manufactured homes are securely anchored to a permanent foundation, approved by the Zoning Officer, shall be skirted within thirty (30) days of placement.
k. Expansion - Existing manufactured home parks may not be extended or expanded into adjoining property.
l. Building/Moved-in Building Permit Required. A building permit is required whenever a manufactured home is moved into or removed from the manufactured home park, or if when an accessory structure is to be constructed.

m. Addresses – Each manufactured home shall have an address number affixed to the manufactured home. Required signage shall consist of a green reflective sign with four (4) inch silver or white reflective numbers.

n. Street Lighting – On all private streets, street light will be provided per approved site plan.

o. Septic Tank/Sanitary Sewer – Existing manufactured home park shall meet the requirements of South Dakota Codified Law and associated administrative rules regarding on-site septic tanks and drainage systems. Existing manufactured home parks shall provide documentation, as requested, from the South Dakota Department of Environment and Natural Resources that the septic system identified in the approved site plan meets minimum standards. If said system fails to meet minimum State standards, said system will be abandoned and replaced with connection to a public sanitary sewerage system or redesigned to meet State standards only after receiving a conditional use permit from the Board of Adjustment. In the event a public central sanitary sewerage system is within two hundred fifty (250) feet of the perimeter of the manufactured home park, said manufactured home park shall request connection to said public central sanitary sewerage system.

CHAPTER 5.11. MANUFACTURED HOME REGULATIONS.

1. A manufactured home is an industrialized building unit constructed on a chassis for towing to the point of use and designed to be used for continuous year-round occupancy as a single dwelling. For the purpose of this Ordinance, manufactured homes will be regulated by types. Two (2) types of homes are defined under these regulations.

a. Type A manufactured home shall:

i. Have more than 1,100 square feet of occupied space in a double-section or larger multi-section unit.

ii. Be anchored to a permanent foundation (permanent perimeter enclosure) and permanent footing.

iii. The age of the manufactured house may not exceed five (5) years from the date of manufacture.

iv. Have a gabled roof with a pitch of at least 2/12 feet.

v. Have siding material of a type customarily used on site-constructed residences.

vi. Have roofing material of a type customarily used on site-constructed residences.

b. Type B manufactured home shall:

i. Have more than 700 square feet of occupied space in a single, double, expando or multi-section unit. Minimum width for a Type B mobile home is fourteen (14) feet.

ii. Utilize a perimeter enclosure of metal, vinyl, wood or styrofoam in accordance with manufacturer's specifications.

iii. The age of the manufactured house may not exceed fifteen (15) years from the date of manufacture.

iv. Be anchored to the ground, in accordance with manufacturer's specifications, or as prescribed by the ANSI/NFPA 501A Standards.

v. Have siding material of a type customarily used on site-constructed residences.

vi. Have roofing material of a type customarily used on site-constructed residences.

vii. Be placed onto a support system, in accordance with approved installation standards, as specified in subsection (2), Installation Standards.

2. Installation Standards.

a. Support System.

i. All HUD-Code manufactured homes of the Type A classification shall be installed with load bearing foundations in conformance with the manufacturer's installation specifications.

ii. Type B manufactured homes not placed on a permanent foundation shall be installed on a support system in conformance with the manufacturer's installation specifications or with the support systems regulations in the ANSI/NFPA 501A installation standards.

b. Foundation/Skirting

i. Those manufactured homes designated in this Ordinance (Type A), as requiring a permanent foundation and permanent perimeter enclosure must have footings and crawl space or basement walls.

a. A crawl space must be constructed of concrete or masonry block grouted solid with one (1) number four or (1/2") horizontal rebar, continuous tied to number four or (1/2") rebar verticals placed in the footing four feet (4') on center.

b. The foundation shall be (a) an approved wood basement constructed of 2 x 6 frame work and treated with water resistant materials; or (b) a foundation shall be constructed with eight inches poured concrete or concrete block.

c. The footing to be a minimum of eight (8) inches thick by sixteen (16) inches wide poured concrete with top of footing to be sixteen (16) inches below grade and the bottom of the footing to be below the frost line.

d. The space between the floor joints of the home shall be completely enclosed with the permanent perimeter enclosure (except for required openings).

ii. All manufactured homes without a permanent perimeter enclosure shall have an approved foundation/siding/skirting enclosing the entire perimeter of the home.

3. Nonconforming Homes.

A manufactured or mobile home placed and maintained on a tract of land and deemed to be a legal nonconforming use prior to the adoption of this Ordinance, shall continue to be a legal nonconforming use. If the nonconforming use is discontinued, the land thereafter must be used in conformity with all provisions of this Ordinance.

4. Replacement of Nonconforming Homes.

Thereafter, upon application to the Zoning Officer and subsequent approval thereof, a manufactured home, deemed a legal nonconforming use, may be replaced by a manufactured home, provided the replacement is of an equal or higher type. Equal or higher type means a Type B manufactured home could be replaced with a Type A or B manufactured home; a Type A manufactured home could be replaced with another Type A manufactured home.

5. Structural Alteration.

Due to its integral design, any structural alteration or modification of a manufactured or mobile home after it is placed on the site must be approved by the Zoning Officer.

6. Variance from Maximum Age Requirement

Type A and B manufactured homes may receive a variance from the maximum age requirement. The Board of Adjustment may grant a variance if the manufactured home meets the following requirements:

a. The applicant shall provide a photograph of the manufactured home's exterior and interior.

b. That it shall have been shown to the satisfaction of the Zoning Officer that the said manufactured home complies with the gas, plumbing, electrical, and construction requirements of Codington County.

c. That the applicant shall obtain the written consent of all property owners owning property immediately adjacent (excluding streets and alleys) to the proposed building site and the consent of sixty-six (66) percent of the property owners within one hundred fifty (150) feet (excluding streets and alleys) of said proposed location has been received.

5.12 TIE DOWN REQUIREMENTS

All manufactured homes, including permanent manufactured homes and regardless of location, shall be tied down as prescribed by the Defense Civil Preparedness Agency, publication TR-75, issued June, 1972, by the U.S. Department of Defense.

CHAPTER 5.132. EXTENDED HOME OCCUPATION.

There are significant differences between home occupations **conducted in residential dwellings** on small tracts and agricultural**-based extended** home occupations. The nature of resources available for use, the benefits and disadvantages created by home occupations, and the problems generated necessitate a distinction between home occupations **conducted in residential dwellings** on small tracts and ~~farm~~ **agricultural-based extended** home occupations.

1. For the purposes of this section, provided all requirements are met, the following shall be considered extended home occupations:

    a. Welding repair conducted in a safe manner.

    b. Veterinarian's office.

    c. Blacksmith.

    d. Service office.

    e. Others which, in the opinion of the Board of Adjustment would not conflict with adjoining land uses.

2. Performance Standards

a. Individuals engaged in such occupation shall consist of family members residing on the premises and up to three (3) non-family employees.

b. There shall be no change in the outside appearance of the buildings or premises, or other visible evidence of the conduct of such home occupation other than one on-premise sign, not to exceed sixteen (16) square feet in area, non-illuminated.

c. Off premise signage for extended home occupations shall be limited to South Dakota Department of Transportation (SDDOT) commercial, directional signs, also known as "Blue Signs". These signs, with SDDOT approval, may be located adjacent to State and Federal Highways.

d. The only retail sales allowed shall consist of the sale of commodities/products prepared on the premises in connection with such occupation or activity. Exception: Seed Sales.

e. There shall be no outdoor storage of materials, vehicles, etc. related to the extended home occupation.

f. Extended home occupations should be agriculturally related and be conducted in an accessory building.

g. No traffic shall be generated by such extended home occupation in greater volumes than would normally be expected in a residential neighborhood, and any need of parking generated by the conduct of such extended home occupation shall be provided off the street and other than in a required front yard.

h. No equipment or process shall be used in such extended home occupation which creates noise, vibration, glare, fumes, odors, or electrical interference detectable to the normal senses off the lot. In the case of electrical interference, no equipment or process shall be used which creates visual or audible interference in any radio or television receivers off the premises, or causes fluctuations in line voltage off the premises.

CHAPTER 5.13. FENCES.

Section 5.13.01. Purpose.

The regulation of fences is intended to protect the public safety and welfare, provide privacy, buffer noise, and allow adequate air, light and vision.

Section 5.13.02. Permit required.

1. Except for the Agricultural District, all fences, walls and hedges shall require a building permit. Customary farm and animal fencing is exempt from this Chapter.

Section 5.13.03. Location/Construction Requirements.

1. Notwithstanding other provisions of this Ordinance, fences, walls, and hedges may be permitted in any required yard. Except fences, walls, and hedges which are more than thirty (30) percent solid shall not be located within fifty (50) feet of an intersection, measuring along the property lines and connecting these two points by a straight line. Further, the fence, wall, or hedge shall not be constructed within twenty-five (25) feet of a public right-of-way or private road. Fences, walls and hedges shall be set back twenty (20) feet from high water mark.
2. Fences, with a maximum height of not more than eighty inches (80) inches, may be erected on any part of a lot other than in the required front yard which shall be limited to a height of forty-eight (48) inches.

3. The County does not provide surveying services. The property owner is responsible for locating property lines.

4. Fences may be built no closer than one (1) foot up to the property line, not to include the public right-of-way. Fences constructed within an identified easement face the potential of removal in the event of necessary work to be conducted within the easement. Replacement of the removed fence is the responsibility of the owner of said fence.

5. The “finished side” of the fence shall face neighboring properties or the road.

6. Approved fencing materials include stone, brick, wood, vinyl, and chain link. No

barbed wire fences shall be allowed in the Lake Park and Planned Residential Districts.

7. Hedges or other plantings which create a fence effect are subject to the same regulations as fences.

8. Fences can be built on the property line when the fence is shared between property owners.

CHAPTER 5.14. ACCESSORY BUILDINGS.

1. Only specifically authorized accessory uses allowed; accessory uses must be subordinate to principal use.

2. No accessory use shall be permitted in any district unless such use is specifically authorized by this Ordinance. No accessory use shall be deemed to be authorized by this Ordinance unless such use is in fact subordinate to and on the same zoning lot with the principal use in conjunction with which it is maintained.

3. No accessory building shall be erected in any required yard, and no separate accessory building shall be erected within five (5) feet of any other building.

4. No accessory building may be used for residential dwelling purposes at any time.

5. Agricultural District.

   In any Agricultural district, any accessory use customarily incident to the principal permitted use or conditional use shall be permitted, except those uses specifically prohibited in the district.

6. Commercial and Industrial Districts.

   In any Commercial or Industrial district, any accessory use customarily incident to the principal permitted use or conditional use shall be permitted, except those uses specifically prohibited in the district.

7. Lake Park and Planned Residential Districts.

   Accessory uses shall be permitted for the principal permitted uses and conditional uses of the Lake Park and Planned Residential Districts only in accordance with the provisions of the following table hereby adopted by reference and declared to be part of this Ordinance.

8. In the TD – Town District certain separate accessory building may be erected within the required side or rear yards provided the following conditions are met:

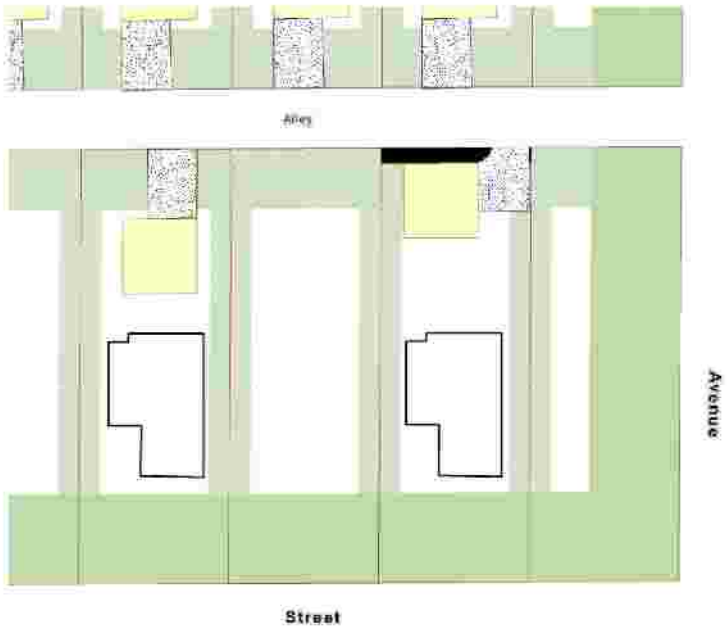
   a. The accessory structure(s) may not exceed two hundred (200) square feet.
   b. In no case shall an accessory structure be placed less than five (5) feet from any side or rear lot line shared by another property in the TD – Town District
   c. Accessory structures located less than the minimum required side or rear yard (see Section 3.10.03.1.a) shall not be constructed upon a permanent foundation.

d. Exception: when garage doors are entered directly from an alley the accessory structure shall not be located closer than twenty (20) feet to the alley line. (See Figure 5.14.8).

Permitted Accessory Uses: LP and PR Districts

Principal Use	Permitted Accessory Uses
Single-family dwellings; duplexes; townhouses and multiple-family dwellings; nursery schools and Day care centers	1. Private garages. a. Attached and unattached garages shall be limited to maximum dimensions per 3.04.07.3.g and conform to the design of the house. b. Attached garages shall be limited to maximum sidewalls of ten (10) feet; and a maximum of 4/12 roof pitch or to conform to the design of the house. c. Unattached garages shall be limited to maximum sidewalls of twelve and one-half (12 ½) feet; and a maximum of 4/12 roof pitch or to conform to the design of the house.
	a. Buildings or structures for customary residential storage purposes not over ten (10) feet in height and not exceeding one hundred fifty (150) square feet in gross floor area. b. Readily moveable sports, recreation, or outdoor cooking equipment. c. Permanent sports or recreational structures or facilities, such as tennis courts, swimming pools, barbeque pits, and similar improvements provided a site plan for such facility is approved d. Home occupations but only as defined herein. e. Non-commercial greenhouses provided that greenhouses over one hundred (100) square feet in floor area must have an approved site plan. f. Off-street parking and storage of vehicles.
Principal Use	Permitted Accessory Uses
Churches, Convents and Monasteries	1. All customarily incidental uses reasonably necessary to allow the free exercise of religion, but not to include commercial use.
All conditional uses	1. All customarily incidental uses reasonably necessary to promote the primary purposes of the principal use, provided that such use must be specifically authorized by the Board of Adjustment for the principal use.
All other items	1. No accessory uses permitted.

Figure 5.14.8



Symbol	Structure
	House
	Garage
	Driveway

Symbol	Required Yard	Setback*
	Front Yard	25'
	Rear Yard	20'
	Side Yard	15'
	Parallel Accessory Building Setback	5'

*Applicable setbacks for TD – Town District.

CHAPTER 5.15 SIGNS.

Section 5.15.01 On-premise and Off-premise Signs

1. **Prohibited signs:**

   a. No sign shall be erected or maintained which creates a hazard due to collapse, fire, collision, decay, or abandonment; or creates traffic hazards, by either:

      i. Confusing or distracting motorists; or

      ii. Impairing the driver's ability to see pedestrians, obstacles or other vehicles, or

      iii. Impairing the driver's ability to see and interpret any official traffic sign, signal or device; or

      iv. Creates a nuisance to persons using a public right-of-way; or

      v. Constitutes a nuisance to occupancy of adjacent and contiguous property by its brightness, size, height, or movement

   b. Any vehicle or trailer parking on public right-of-way, public property or private property so as to be visible from the public right-of-way and which displays an advertising message, unless said vehicle is used in the regular course of a business.

2. Signs shall be permitted in zoning districts per Article III, subject to the following provisions:

   a. Wall signs may be located anywhere on the wall of a building.

   b. Signs shall not project over public property.

   c. Signs shall not be erected adjacent to a corner of two (2) intersecting streets, unless such signs are constructed to not obstruct the view of said intersection. See Chapter 5.01.

   d. Each sign – size, lighting, and location - in the County shall at least meet the standards established by the South Dakota Department of Transportation.

   e. Other than utility fixtures or holiday decorations, no signs, awnings, or display shall be suspended, hanged, or placed so that the same shall hang over any part of a street or sidewalk, used for vehicular or pedestrian travel unless a written application for a permit is made to the Zoning Officer and the said Official grants a permit therefore.

   f. The Zoning Officer shall take into consideration factors that would make the proposed structure likely to endanger the property or personal safety of passerby traveling the streets or sidewalks in question, and whether or not such structure complies with codes relating to outdoor advertising.

3. On-premise Signs: Each sign erected as an on-premise sign in those zoning districts where permitted shall, unless specified elsewhere in this ordinance, conform to the following requirements:

   a. Unless otherwise specified herein, each sign shall have a maximum surface area of eighty (80) square feet and shall observe all yard and height requirements of the district in which it is located.
   b. No on-premise sign may be converted to an off-premise sign.

4. Off-premise Signs: Off-premise signs erected in those zoning districts where permitted shall, unless specified elsewhere in this ordinance, conform to the following requirements:

   a. Maximum off-premise sign area:
      i. Signs primarily visible from Interstate 29: The maximum surface area of any off-premise sign facing any one direction shall be twelve hundred (1,200) square feet.

      ii. Signs primarily visible from all other roadways: ~~Each sign shall have a~~ The maximum surface area of any off-premise sign facing any one direction shall be ~~of~~ three hundred (300) square feet. Stacked signs (two or more signs stacked vertically on a single sign structure) are prohibited.

   b. The sign structure or sign shall have a maximum height of thirty (30) feet. Height of sign is the vertical distance from the top of the sign or sign structure, whichever is greater, to the ground in a straight line directly below, measured

from a point equidistant from the sides or edges of the sign.

c. **Off-premise signs shall comply with all applicable state and federal requirements.** ~~Stacked signs (two or more signs stacked vertically on a single sign structure are prohibited.~~

d. Each sign shall not be closer than three hundred (300) feet from any street intersection and five hundred (500) feet from another permitted Off-premise sign on the same side of the street or road.

e. Each sign shall not be closer than ten (10) feet from any street right-of-way.

f. Each sign shall not be closer than two hundred fifty (250) feet from adjoining property lines.

CHAPTER 5.16. STRUCTURES TO HAVE ACCESS.

Every building hereafter erected or moved shall be on a lot adjacent to a public street, or with access to private streets approved by the Board of Adjustment, and all structures shall be so located on lots as to provide safe and convenient access for services, fire protection and required off-street parking.

CHAPTER 5.17. YARDS.

No part of a yard or other open space, or off-street parking or loading space required about or in connection with any building for the purpose of complying with this ordinance, shall be included as part of a yard, open space, or off-street parking or loading space similarly required for any other building.

Section 5.17.01. Yards, Reduction in Size.

No yard or lot existing at the time of passage of this ordinance shall be reduced in dimension or area below the minimum requirements set forth herein. Yards and lots created after the effective date of this ordinance shall meet at least the minimum requirements established by this ordinance.

Section 5.17.02. Additional Yard Requirements.

The following yard requirements must be observed in addition to the yard requirements of the various districts:

1. A corner lot must have a front yard on both streets

2. On developed property, in the LP-Lake Park District and PR-Planned Residential District, fronting on one side of the street between two streets where one or more residences already exist, no building shall hereafter be erected and no existing building shall be reconstructed or altered in such a way that any portion thereof shall be closer to the street line than the average improved building front on that street in that block, but in no case shall the set-back line be less than twelve (12) feet from the front lot line..

3. In the LP and PR Districts, on through lots and reversed frontage lots, a front yard must be provided on both streets.

4. In the LP and PR Districts, required front yards shall be devoted entirely to landscaped area except for the necessary paving or driveways and sidewalks to reach parking or loading areas in the side or rear yard.

Section 5.17.03. Exceptions to Yard Requirements.

The following exceptions may be made to the yard requirements in the LP and PRL Districts:

1. Air conditioning units, sills, chimneys, cornices, and ornamental features may project into a required yard a distance not to exceed twenty-four (24) inches.

2. In commercial and industrial districts, filling station pumps and pump islands may occupy required yards, provided, however, that they are not less than fifteen (15) feet from all lot lines.

3. An accessory building may be located in a rear yard but not occupy more than 30 percent of a rear yard.

4. Any accessory buildings closer than ten (10) feet to a main building shall be considered as part of the main building and shall be provided with the same side and rear yard requirements as the main building.

CHAPTER 5.18. PERMANENT FOUNDATIONS REQUIRED FOR DWELLINGS.

No dwelling shall be constructed, installed, or moved into the area under the jurisdiction of these regulations, unless said dwelling is constructed upon, installed on or moved onto a permanent foundation, as defined in these regulations. Exempted from this requirement are manufactured homes as defined herein.

CHAPTER 5.19. UTILITY EASEMENTS.

No building or addition thereto shall be erected over or across any existing public utility or upon any platted easement.

CHAPTER 5.20. ERECTION OF MORE THAN ONE PRINCIPAL STRUCTURE ON A LOT.

In any district, only one (1) structure housing a permitted or permissible principal use may be erected on single lot, provided that yard and other requirements are met.

CHAPTER 5.~~14~~21. CONCENTRATED ANIMAL FEEDING OPERATION REGULATIONS.

Section 5.21.01 Intent

An adequate supply of healthy livestock, poultry and other animals is essential to the well-being of county citizens and the State of South Dakota. However, livestock, poultry, and other animals produce manure which may, where improperly stored, transported, or disposed, negatively affect the County' environment. Animal manure must be controlled where it may add to air, surface water, ground water, or land pollution. The following regulations have been adopted to provide protection against pollution caused by manure from domesticated animals. All new and proposed expansions of Concentrated Animal Feeding Operations shall comply with the regulations as outlined herein.

It is the intention of the Board of Adjustment in the enforcement of this ordinance that when an operator of an existing Concentrated Animal Feeding Operation applies for a permit to expand to another class level, the standards that apply to the expansion will not be applied to existing structures that were built in compliance with accepted industry standards in existence at the time of the construction of such facilities.

~~**Definitions**~~

~~**Animal Manure**: Poultry, livestock, or other animal excreta or mixture of excreta with feed, bedding or other materials.~~

~~**Animal Unit**: See page 56.~~

~~***Applicant*:** An individual, a corporation, a group of individuals, partnership, joint venture, owners, or any other business entity having charge or control of one or more concentrated animal feeding operations.~~

~~**Change in Operation**: "Change in operation" means a cumulative increase of more than 300 animal units, or change in animal species, after July 1, 1997, which are confined at an unpermitted concentrated animal feeding operation.~~

~~**Farm Dwelling***: Any dwelling farmer owned or occupied by the farm owners, operators, tenants, or seasonal or year-around hired workers.~~

~~**Non-Farm Dwelling***: Any occupied dwelling which is not a farm dwelling.~~

~~**Permit***: A permit required by these regulations unless stated otherwise.~~

~~**Potential Pollution Hazard***: A Concentrated Animal Feeding Operation of 50 to 499 Animal Units may be classified as a Class 4 Operation by the County Zoning Officer when a Potential Pollution Hazard exists. Factors to be considered by the Zoning Officer in determining a Potential Pollution Hazard include the following:~~

~~1. The Concentrated Animal Feeding Operation does not meet the minimum setback and separation distances of these regulations.~~

~~2. A Potential Water Pollution Hazard exists due to siting over a shallow aquifer or drainage which contributes to the waters of the State.~~

Process Generated Wastewater: Water directly or indirectly used in the operation of an animal feeding operation. The term includes spillage or overflow from watering systems; water and manure collected while washing, cleaning or flushing pens, barns, manure pits or other areas; water and manure collected during direct contact swimming, washing or spray cooling of animals; and water used in dust control.

Process Wastewater: "Process wastewater" means any process generated wastewater and any precipitation (rain or snow) that comes into contact with the animals, manure, litter or bedding, feed, or other portions of the animal feeding operation. The term includes runoff from an open lot.

Shall means that the condition is an enforceable requirement of this permit.

Shallow Aquifer: An aquifer vulnerable to contamination because the permeable material making up the aquifer (a) extends to the land surface so percolation water can easily transport contaminants from land surface to the aquifer, or (b) extends to near the land surface and lacks a sufficiently thick layer of impermeable material on the land or near the land surface to limit percolation water from transporting contaminants from the land surface to the aquifer.

Shallow Well: A well which is located in a shallow aquifer.

Should means that the condition is a recommendation. If violations of the permit occur, the County will evaluate whether the producer implemented the recommendations contained in this permit that may have helped the producer to avoid the violation.

Significant Contributor of Pollution: To determine if a concentrated animal feeding operation meets this definition, the following factors are considered:

1. Size of feeding operation and amount of manure reaching waters of the state;

2. Location of the feeding operation in relation to waters of the state;

3. Means of conveyance of manure and process wastewater into waters of the state; and

4. The slope, vegetation, rainfall and other factors affecting the likelihood or frequency of discharge of animal wastes and process wastewater into waters of the state.

Waters of the State means all waters within the jurisdiction of this state, including all streams, lakes, ponds, impounding reservoirs, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private, situated wholly or partly within or bordering upon the state.

Section 5.21.02. Animal Units.

Table 5.21.1 shows Animal species and number of a species required to equal 500, 1,000 and 2,000 animal units. Note that these figures relate to inventory rather than annual production. Other animal species equivalents which are not listed will be based on species' waste production.

TABLE 5.21.1
EQUIVALENT NUMBER OF A SPECIES TO EQUAL:

ANIMAL SPECIES	500 AU	1,000 AU	2,000 AU	ANIMAL UNIT EQUIVALENT SPECIES/AU
Feeder or Slaughter Cattle	500 hd	1,000 hd	2,000 hd	1.0
Mature Dairy Cattle	350 hd	700 hd	1,400 hd	1.43
Calves (up to 400 pounds)	**1250 hd**	**2,500 hd**	**5,000 hd**	**0.4**
Finisher Swine (over 55 lbs)	1,250 hd	2,500 hd	5,000 hd	0.4
Nursery Swine (less than 55 lbs)	5,000 hd	10,000 hd	20,000 hd	0.1
Farrow-to-Finish (sows)	135 hd	270 hd	540 hd	3.7
Swine Production Unit (Sows Breeding, Gestating & Farrowing)	1,060 hd	2,130 hd	4,260 hd	0.47
Horses	250 hd	500 hd	1,000 hd	2.0
Sheep	5,000 hd	10,000 hd	20,000 hd	0.1
Turkeys	27,750 hd	55,000 hd	110,000 hd	0.018
Laying Hens and Broilers (continuous overflow watering in facility)	50,000 hd	100,000 hd	200,000 hd	0.01
Laying Hens and Broilers (liquid handling system in confinement facility)	15,150 hd	30,000 hd	60,000 hd	0.033
Ducks	2,500 hd	5,000 hd	10,000 hd	0.2

Section 5.21.03 Classes of Concentrated Animal Feeding Operations

A Concentrated Animal Feeding Operation is defined as a lot, yard, corral, building or other area where animals have been, are, or will be stabled or confined for a total of **forty-five** (45) days or more during any **twelve** (12)-month period, and where crops, vegetation, forage growth, or post harvest residues are not sustained over any portion of the lot or facility. Two or more animal feeding operations under common ownership are single animal operation if they adjoin each other, or if they use a common area, or if they use a common area or system for disposal of manure.

For the purpose of these regulations, Concentrated Animal Feeding Operations are divided into the following classes:

	ANIMAL UNITS	
Class 1	2,000 or more	
Class 2	1,000 to 1,999	
Class 3	500 to 999	
Class 4	50 to 499	(Potential water pollution hazard)
Class 5	50 to 499	(No pollution hazard)

Section 5.21.04. Concentrated Animal Feeding Operation Permit Requirements.

Owners of Class 1, Class 2, Class 3, and Class 4 Concentrated Animal Feeding Operations are required to complete a permit application whenever any of the following occur:

1. A new Concentrated Animal Feeding Operation is proposed where one does not exist.

2. An expansion is proposed beyond what a current permit allows.

3. A cumulative expansion by three hundred (300) animal units, after July 1, 1997, of existing concentrated animal feeding operation that does not have a permit.

4. A change in ownership or transfer of control.

5. An existing concentrated animal feeding operation is to be restocked after being idle for five (5) or more years.

6. A signed complaint has been received **and/or documented** ~~or made~~ by the County Zoning Officer or South Dakota Department of Environment and Natural Resources and after inspection reveals that the Concentrated Animal Feeding Operation is in violation of County or State regulations.

Section 5.21.05. Concentrated Animal Feeding Operation Control Requirements.

1. No Significant Contribution of Pollution

In general, no Concentrated Animal Feeding Operation shall be constructed, located, or operated so as to create a significant contribution of pollution.

2. State General Permit

Classes 1 and 2 Concentrated Animal Feeding Operations shall obtain a State General Permit pertaining to the animal species of the Concentrated Animal Feeding Operation. A County permit may be approved conditioned on receiving a State permit.

Classes 3 and 4 Concentrated Animal Feeding Operations will be required to obtain a State General Permit if the following occur:

a. If an earthen storage basin or lagoon is used for manure storage, excluding existing operations that are improving waste handling facilities according to Natural Resource Conservation Service standards.

b. The Board of Adjustment decides conditions require a State permit.

3. Nutrient Management Plan.

a. Class 1, 2, 3, and 4 Concentrated Animal Feeding Operations **are required to have a nutrient management plan** ~~shall submit a Nutrient Management Plan~~. The applicant shall develop, maintain, and follow a nutrient management plan to ensure safe disposal of manure and protection of surface and ground water. The South Dakota Department of Environment & Natural Resources must approve the plan prior to land application of any wastes. Due to crop rotation, site changes, and other operational

changes, the producer should update the plan annually to reflect the current operation and crops grown on the application sites. The applicant shall collect, store, and dispose of liquid and solid manure according to recognized practices of good agricultural management. The economic benefits derived from agricultural operations carried out at the land disposal site are secondary to the proper and safe disposal of the manure.

b. **The Nutrient Management Plan is a conservation system for an animal feeding operation. It describes practices and management activities on how best to utilize manure as a fertilizer resource while protecting surface and ground water. The plan deals specifically with managing the amount, source, placement, and timing of the application of manure nutrients to the land. The use of other nutrient sources (i.e. commercial fertilizer) also must be taken into account when planning manure applications. All nutrient management plans developed must meet the current Natural Resources Conservation Service (NRCS) South Dakota Technical Nutrient Management Standard (590) and all applicable DENR and Codington County Zoning Standards.**

~~A generic nutrient management plan that the applicant may use in developing a nutrient management plan is available from the South Dakota Department of Environment & Natural Resources. The generic nutrient management plan is based on application of nitrogen. The applicant may use other plans, provided the alternate plan contains all the information necessary to determine compliance with conditions of this general permit. Nitrogen, in addition to that allowed in the nutrient management plan, may be applied up to the amounts as indicated by soil or crop nitrogen test results that are necessary to obtain the realistic crop yield.~~

~~The South Dakota Department of Environment & Natural Resources recommends and encourages producers to develop nutrient management plans for other nutrients such as phosphorous and potassium. Over application of these nutrients may lead to water quality problems in area lakes and streams and result in potential damage to the producer's land and crop~~.

c. The applicant must maintain records to show compliance with the plan.

d. The plan must comply with County Manure Application Setbacks.

e. Land spreading agreements shall be provided if applicant does not have minimum acreage to apply animal manure.

4. Manure Management and Operation Plan

Classes 1, 2, 3, and 4 Concentrated Animal Feeding Operations shall submit a Manure Management and Operation Plan.

~~A~~a. Plan must include:

~~1.~~i. The location and specifics of proposed animal manure facilities.

~~2.~~ii. The operation procedures and maintenance of manure facilities.

~~3.~~iii.Plans and specifications must be prepared or approved by a registered professional engineer, or a Natural Resource Conservation Service (NRCS)

engineer. Waste treatment facilities will require inspection by an engineer and as-built plans to be submitted to the County Zoning Officer.

~~4.~~**iv**.Animal manure shall not be stored longer than two years.

~~5.~~**v**. Manure containment structures shall provide for a minimum design volume of three hundred sixty-five (365) days of storage for 1,000 animal units or more and **two hundred forty** (240) days of storage for less than **one thousand** 1,000 animal units. The Board of Adjustment may reduce the number of days of storage if deemed appropriate.

~~6.~~**vi**.Producers shall keep records on manure applications on individual fields which document acceptable manure and nutrient management practices have been followed. These records shall include soils test results for surface two feet of soil, actual and projected crop yields, nutrient analysis of manure, and information about date, rate and method of manure applications for individual fields.

~~B~~**b**. As a condition of the permit, the County Board of Adjustment may require the producer to participate in environmental training programs and become a certified livestock manager.

5. Management Plan for Fly and Odor Control

Classes 1, 2, 3, and 4 Concentrated Animal Feeding Operations shall dispose of dead animals, manure and wastewater in such a manner as to control odors or flies. A management plan is required for submission of a permit. The County Board of Adjustment will review the need for control measures on a site-specific basis, taking into consideration prevailing wind direction and topography. The following procedures to control flies and odors should be considered in a management control plan.

~~A~~**a**. Operational plans for manure collection, storage treatment and use must be kept updated and implemented.

~~B~~**b**. Methods to be utilized to dispose of dead animals should be included in the management plan.

~~C~~**c**. Plant trees and shrubs to reduce wind movement of odors away from buildings, manure storage ponds and/or lagoons.

~~D~~**d**. Provide adequate slope and drainage to remove surface water from pens and keep pen area dry so odor production is minimized.

~~E~~**e**.Store solid manure in containment areas having good drainage to minimize odor production.

~~f~~**a**. Remove manure from open pens as frequently as possible to minimize odor production.

~~G~~**g**.Consider use of covers on open storage systems for liquid manure systems to reduce odor production.

~~H~~**h**.Avoid spreading manure on weekends, holidays and evenings during warm season when neighbors may be involved in outdoor recreation activities.

~~i~~. Avoid spreading during calm and humid days, since these conditions restrict the dispersion and dilution of odors.

6. Suggested Setbacks and Separation Distance for New Concentrated Animal Feeding Operations and those Expanding by 300 or More Animal Units after July 1, 1997.

SUGGESTED MINIMUMS

	CLASS 1	CLASS 2	CLASS 3	CLASS 4 & 5
Established Residences	2,640 feet	1,760 feet	1,320 feet	1,320 feet
Churches, Businesses and Commercially Zoned Areas, Town Districts	2,640 feet	2,640 feet	1,320 feet	1,320 feet
Incorporated Municipality Limits	5,280 feet plus 440 feet for each additional 1,000 AU over 2,000	5,280 feet	2,640 feet	1,320 feet
Private Wells other than the operator	2,640 feet	1,760 feet	1,320 feet	1,320 feet
Lakes and Streams classified as Fisheries as identified by the State	500 feet	500 feet	200 feet	200 feet
Federal, State & County Road ROW				
Confinement	300 feet	300 feet	200 feet	200 feet
Open Lot	150 feet	150 feet	150 feet	150 feet
Township Road ROW				
Confinement	150 feet	150 feet	150 feet	150 feet
Open Lot	150 feet	150 feet	150 feet	150 feet

~~Proposals for new Concentrated Animal Feeding Operations, on a site-by-site basis, shall be set back from adjoining property lines as determined by the County Board of Adjustment.~~

Each application for a new or expanded Concentrated Animal Feeding Operation (CAFO) will be reviewed by the Board of Adjustment on a site-specific basis. The Board of Adjustment reserves the right to increase or decrease suggested required setbacks and separation distance on a site specific review, based on one **(1)** or more of the following considerations.

a. Considerations To Decrease Suggested Setbacks And Separation Distances

i. An existing Concentrated Animal Feeding Operation proposes to expand but does not meet suggested setback or separation distances, the Board of Adjustment may reduce suggested setbacks and separation distances after review of past management practices and proposed improvements to waste handling facilities.

ii. A new Concentrated Animal Feeding Operation is proposed which, because of the waste handling facilities, would not require conformance with suggested setback and separation distances as outlined herein.

b. Considerations To Increase Suggested Setbacks And Separation Distances

~~A.~~**i.** A concentration of CAFOs in the area exists or would occur which may pose an air or water quality concern.

~~B.~~**ii.** Due to topography and prevailing wind direction, additional setback and separation distance is appropriate to safeguard air or water quality.

~~C.~~**iii.** A Concentrated Animal Feeding Operation is in excess of 5,000 animal units.

7. Manure Application Setbacks

The following manure application setbacks apply to all classes of Concentrated Animal Feeding Operations.

~~B.~~**a**. The County Board of Adjustment may require liquid manure to be incorporated or injected in order to minimize air and water quality impacts.

~~C.~~**b**. Requests for application of liquid manure by means of irrigation will be reviewed by the Board of Adjustment on a site-specific basis. Impact on air and water quality will be taken into consideration.

~~A.~~**c**. The following manure application setbacks apply to all classes of Concentrated Animal Feeding Operations.

COUNTY MANURE APPLICATION SETBACKS

CATEGORY	SURFACE IRRIGATION APPLIED	INCORPORATED OR INJECTED
Lake, Rivers and Streams Classified as Fisheries	300 feet	100 feet (lake) 50 feet (river & stream)
Streams and Lakes Classified as Drinking Water Supplies	1000 feet	300 feet
Public Roads	25 feet (surface) from right-of-way 300 feet (irrigation)	10 feet from right-of-way
Area of 10 or more Residences	300 feet (surface) 1,000 feet (irrigation)	300 feet
Public Wells	1000 feet	1000 feet
Private Shallow Wells	250 feet	250 feet
A Residence other than the Operator	300 feet (surface) 1,000 feet (irrigation)	300 feet

Natural or Manmade Drainage	200 feet	50 feet

8. Standards for ~~Special Exceptions~~ Conditional Uses

a. The County Board of Adjustment may request information relating to a Concentrated Animal Feeding Operation not contained in these regulations.

b. The County Board of Adjustment may impose, in addition to the standards and requirements set forth in these regulations additional conditions which the Board of Adjustment considers necessary to protect the public health, safety and welfare.

c. ~~Special Exceptions~~ **Conditional Uses** shall be in effect only as long as sufficient land specified for spreading purposes is available for such purposes and other provisions of the permit are being adhered to.

d. When considering an application, the County Board of Adjustment will take into consideration current and past violations relating to Concentrated Animal Feeding Operations that the applicant has an interest in.

e. Permit applicants will be required to file a letter of assurances as required by the Board of Adjustment. The letter of assurances will be prepared by the zoning officer and signed by both the applicant and the zoning officer. The permit for the concentrated animal feeding operation is based upon compliance with the regulations herein, and letter of assurances. Any violation of the regulations or non compliance with the letter of assurances shall be cause for revoking a permit. Permit applicants will be notified by registered mail and a hearing before the board of adjustment will be held concerning status of the permit. The Board of Adjustment shall either revoke the permit or set a time line for compliance. If compliance is not met, the permit shall be revoked and the permit holder ordered to cease operations.

9. Information Required for Class 1 and 2 Concentrated Animal Feeding Operation Permit.

a. Owner's name, address and telephone number.

b. Legal descriptions of site and site plan.

c. Number and type of animals.

d. Nutrient management plan.

e. Manure management and operation plan.

f. Management plan for fly and odor control.

g. Information on ability to meet suggested setbacks and separation distance including site plan to scale.

h. General permit from South Dakota Department of Environment & Natural Resources if available for animal species.

i. Review of plans and specifications and nutrient management plan by the South Dakota Department of Environment & Natural Resources.

j. Information on soils, shallow aquifers, designated wellhead protection areas, and 100-year floodplain designation.

k. Notification of whomever maintains the access road (township, county and state). Notification of public water supply officials.

l. Any other information as contained in the application and requested by the County Zoning Officer.

10. Information Required for Class 3 and 4 Concentrated Animal Feeding Operation Permit.

a. Owner's name, address and telephone number.

b. Legal descriptions of site and site plan.

c. Number and type of animals.

d. Nutrient management plan.

e. Manure management and operation plan.

f. Management plan for fly and odor control.

g. Information on ability to meet suggested setbacks and separation distance, including site plan to scale.

h. Review of plans and specifications and nutrient management plan by the South Dakota Department of Environment & Natural Resources if using lagoon or earthen storage basin.

i. Information on soils, shallow aquifers, designated wellhead protection areas, and 100-year floodplain designation.

j. Notification of whomever maintains the access road (township, county and state). Notification of public water supply officials.

k. Any other information as contained in the application and requested by the County Zoning Officer.

CHAPTER 5.~~15~~22. WIND ENERGY SYSTEM (WES) REQUIREMENTS.

Section 5.~~15~~22.01.A Applicability.

~~A.~~**1.** The requirements of these regulations shall apply to all WES facilities except private facilities with a single tower height of less than seventy-five (75) feet and used primarily for on-site consumption of power.

Section 5.~~15~~22.02.~~B~~ Federal And State Requirements.

~~A.~~**1.** All WESs shall meet or exceed standards and regulations of the Federal Aviation and South Dakota State Statutes and any other agency of federal or state government with the authority to regulate WESs.

Section 5.~~15~~22.03.~~C~~ General Provisions.

~~A.~~**1.** Mitigation Measures

a. Site Clearance. The permittees shall disturb or clear the site only to the extent necessary to assure suitable access for construction, safe operation and maintenance of the WES.

b. Topsoil Protection. The permittees shall implement measures to protect and segregate topsoil from subsoil in cultivated lands unless otherwise negotiated with the affected landowner.

c. Compaction. The permittees shall implement measures to minimize compaction of all lands during all phases of the project's life and shall confine compaction to as small an area as practicable.

d. Livestock Protection. The permittees shall take precautions to protect livestock during all phases of the project life.

e. Fences. The permittees shall promtply replace or repair all fences and gates removed or damaged during all phases of the project's life unless otherwise negotiated with the affected landowner.

f. Roads

i. Public Roads. Prior to commencement of construction, the permittees shall identify all state, county or township "haul roads" that will be used for the WES project and shall notify the state, county or township governing body having jurisdiction over the roads to determine if the haul roads identified are acceptable. The governmental body shall be given adequate time to inspect the haul roads prior to use of these haul roads. Where practical, existing roadways shall be used for all activities associated with the WES. Where practical, all-weather roads shall be used to deliver cement, turbines, towers, assemble nacelles and all other heavy components to and from the turbine sites.

ii. The permittees shall, prior to the use of approved haul roads, make satisfactory arrangements with the appropriate state, county or township governmental body having jurisdiction over approved haul roads for construction of the WES for the maintenance and repair of the haul roads that will be subject to extra wear and tear due to transportation of equipment and WES components. The permittees shall notify the County of such arrangements upon request of the County.

iii. Turbine Access Roads. Construction of turbine access roads shall be minimized. Access roads shall be low profile roads so that farming equipment can cross them and shall be covered with Class 5 gravel or similar material. When access roads are constructed across streams and drainageways, the access roads shall be designed

in a manner so runoff from the upper portions of the watershed can readily flow to the lower portion of the watershed.

iv. Private Roads. The permittees shall promptly repair private roads or lanes damaged when moving equipment or when obtaining access to the site, unless otherwise negotiated with the affected landowner.

v. Control of Dust. The permittees shall utilize all reasonable measures and practices of construction to control dust.

g. Soil Erosion and Sediment control Plan. The permittees shall develop a Soil Erosion and Sediment Control Plan prior to construction and submit the plan to the County. The Soil Erosion and Sediment Control Plan shall address the erosion control measures for each project phase, and shall at a minimum identify plans for grading, construction and drainage of roads and turbine pads; necessary soil information; detailed design features to maintain downstream water quality; a comprehensive revegetation plan to maintain and ensure adequate erosion control and slop stability and to restore the site after temporary project activities; and measures to minimize the area of surface disturbance. Other practices shall include containing excavated material, protecting exposed soil, stabilizing restored material and removal of silt fences or barriers when the area is stabilized. The plan shall identify methods for disposal or storage of excavated material.

d. Setbacks. Wind turbines shall meet the following minimum spacing requirements.

a. Distance from existing off-site residences, business**es, churches,** and ~~public~~ buildings **owned and/or maintained by a governmental entity** shall be **at least** one thousand (1,000) feet. Distance from on-site or lessor's residence shall be **at least** five hundred (500) feet.

b. Distance from centerline of public roads shall be **at least** ~~two (2) times~~ **one hundred ten percent (110%)** the height of the wind turbines, measured from the ground surface to the tip of the blade when in a fully vertical position.

c. Distance from any property line shall be **at least** ~~two (2) times~~ **one hundred ten percent (110%)** the height of the wind turbine, measured from the ground surface to the tip of the blade when in a fully vertical position unless wind easement has been obtained from adjoining property owner.

e. Electromagnetic Interference. The permittees shall not operate the WES so as to cause microwave, television, radio, or navigation interference contrary to Federal Communications Commission (FCC) regulations or other law. In the event such interference is caused by the WES or its operation, the permittees shall take the measures necessary to correct the problem.

f. Lighting. Towers shall be marked as required by the Federal Aviation Administration (FAA). There shall be no lights on the towers other than what is required by the FAA. This restriction shall not apply to infrared heating devices used to protect the monitoring equipment.

g. Turbine Spacing. The turbines shall be spaced **no closer** than three (3) rotor diameters (RD) **(measurement of blades tip to tip)** within a string ~~and 10 RDs between strings~~. If required during final micro siting of the turbines to account for topographic conditions, up to

ten (10**)** percent of the towers may be sited closer than the above spacing but the permittees shall minimize the need to site the turbines closer.

h. Footprint Minimization. The permittees shall design and construct the WES so as to minimize the amount of land that is impacted by the WES. Associated facilities in the vicinity of turbines such as electrical/electronic boxes, transformers and monitoring systems shall ~~to the greatest extent feasible~~ be mounted on the foundations used for turbine towers or inside the towers unless otherwise negotiated with the affected landowner.

i. ~~Electrical Cables~~ **Collector Lines**. **When located on private property, t**~~T~~he permittees shall place electrical lines, known as collectors, and communication cables underground **between the WES and the feeder lines** ~~when located on private property~~. **The exception to this requirement is when the total distance of the collectors from the substation require an overhead installation due to line loss of current from an underground installation.** Collectors and cables shall also be placed within or immediately adjacent to the land necessary for turbine access roads unless otherwise negotiated with the affected landowner. This paragraph does not apply to feeder lines.

j. Feeder Lines. The permittees shall place overhead electric lines, known as feeders, on public rights-of-way if a public right-of-way exists. Changes in routes may be made as long as feeders remain on ~~pubic~~ **public** rights-of-way and approval has been obtained from the governmental unit responsible for the affected right-of-way. If no public right-of-way exists, the permittees may place feeders on private property. When placing feeders on private property, the permittees shall place the feeder in accordance with the easement negotiated with the affected landowner. The permittees shall submit the site plan and engineering drawings for the feeder lines before commencing construction.

k. Decommissioning/Restoration/Abandonment

a. Decommissioning Plan. Within 120 days of completion of construction, the permittees shall submit to the County a decommissioning plan describing the manner in which the permittees anticipate decommissioning the project in accordance with the requirements of paragraph (b) below. The plan shall include a description of the manner in which the permittees will ensure that it has the financial capability to carry out these restoration requirements when they go into effect. The permittees shall ensure that it carries out its obligation to provide for the resources necessary to fulfill these requirements. The County may at any time request the permittees to file a report with the County describing how the permittees are fulfilling this obligation.

b. Site Restoration. Upon expiration of this permit, or upon earlier termination of operation of the WES, the permittees shall have the obligation to dismantle and remove from the site all towers, turbine generators, transformers, **overhead collector and feeder lines,** ~~overhead and underground cables,~~ foundations, buildings and ancillary equipment to a depth of four **(4)** feet. To the extent possible the permittees shall restore and reclaim the site to its pre-project topography and topsoil quality. All access roads shall be removed unless written approval is given by the affected landowner requesting that one or more roads, or portions thereof, be retained. Any agreement for removal to a lesser depth or for no removal shall be recorded with the County and shall show the locations of all such foundations. All such agreements between the permittees and the affected landowner shall be submitted to the County prior to completion of restoration activities. The site shall be restored in accordance with the requirements of this condition within eighteen **(18)** months after expiration.

c. Abandoned Turbines. The permittees shall advise the County of any turbines that are abandoned prior to termination of operation of the WES. The County may require the permittees to decommission any abandoned turbine.

10. Height from Ground Surface. The minimum height of blade tips, measured from ground surface when a blade is in fully vertical position, shall be twenty-five (25) feet.

11. Towers.

    a. Color and Finish. The finish of the exterior surface shall be non-reflective and non-glass.

    b. All towers shall be singular tubular design.

12. Noise. Noise level shall not exceed 50 dBA, **average A-weighted Sound pressure** including constructive interference effects at the property line of existing off-site residences, businesses, and ~~public~~ buildings **owned and/or maintained by a governmental entity.**

13. Permit Expiration. The permit shall become void if no substantial construction has been completed within three (3) years of issuance.

14. Required Information for Permit.

    a. Boundaries of the site proposed for WES and associated facilities on United States Geological Survey Map or other map as appropriate.

    b. Map of easements for WES.

    c. Map of occupied residential structures, businesses, **churches,** and ~~public~~ buildings **owned and/or maintained by a governmental entity**.

    d. Map of sites for WES, access roads and utility lines.

    e. Location of other WES in general area.

    f. Project schedule.

    g. Mitigation measures.

    h. Haul road agreements

        i. Haul road agreements will state that collector and feeder lines will not be trenched across public roads or public road right-of-ways.

CHAPTER 5.~~16~~23 WILLOW CREEK FLOOD DAMAGE PREVENTION.

The Codington County Planning Commission and County Commissioners shall require an applicant who requests a use permit or plat in the geographic area identified within the scientific and engineering report entitled “Willow Creek Floodplain Study” to follow the requirements found within the City of Watertown’s Willow Creek Flood Damage Prevention Ordinance (Adopted by the City of Watertown on April 2, 2001),

CHAPTER 5.~~17~~24 WIRELESS TELECOMMUNICATIONS TOWERS AND FACILITIES.

Section 5.~~17~~24.01. Purposes.

1. The general purpose of this Section is to regulate the placement, construction, and modification of Towers and Telecommunications Facilities in order to protect the health, safety, and welfare of the public, while at the same time not unreasonably interfering with the development of the competitive wireless telecommunications marketplace in the County. Specifically, the purposes of this Ordinance are:

    a. To regulate the location of Towers and Telecommunications Facilities in the County;

    b. To protect residential areas and land uses from potential adverse impact of Towers and Telecommunications Facilities;

    c. To minimize adverse visual impact of Towers and Telecommunications Facilities through careful design, siting, landscaping, and innovative camouflaging techniques;

    d. To promote and encourage shared use/collocation of Towers and Antenna Support Structures as a primary option rather than construction of additional single-use Towers;

    e. To promote and encourage utilization of technological designs that will either eliminate or reduce the need for erection of new Tower structures to support antenna and Telecommunications Facilities;

    f. To avoid potential damage to property caused by Towers and Telecommunications Facilities by ensuring such structures are soundly and carefully designed, constructed, modified, maintained, and removed when no longer used or are determined to be structurally unsound; and

    g. To ensure that Towers and Telecommunications Facilities are compatible with surrounding land uses.

~~**Section 5.17.1. Definitions.**~~

~~The following words, terms, and phrases, when used in this Section, shall have the meanings ascribed to them in this Section, except where the context clearly indicates a different meaning:~~

~~A. Antenna Support Structure means any building or structure other than a Tower which can be used for location of Telecommunications Facilities.~~

~~B. Applicant means any Person that applies for a Tower development permit.~~

~~C. Application means the process by which the Owner of a parcel of land within the County submits a request to develop, construct, build, modify, or erect a Tower upon such parcel of land. Application includes all written documentation, verbal statements, and representations, in whatever form or forum, made by an Applicant to the County concerning such a request.~~

~~D. Engineer means any engineer licensed by the State of South Dakota.~~

~~E. Owner means any Person with fee title or a long-term (exceeding ten (10) years) leasehold~~

~~to any parcel of land within the County who desires to develop, or construct, build, modify, or erect a Tower upon such parcel of land.~~

~~F. Person is any natural person, firm, partnership, association, corporation, company, or other legal entity, private or public, whether for profit or not for profit.~~

~~G. Stealth means any Tower or Telecommunications Facility which is designed to enhance compatibility with adjacent land uses, including, but not limited to, architecturally screened roof-mounted antennas, antennas integrated into architectural elements, and Towers designed to look other than like a Tower such as light poles, power poles, and trees. The term Stealth does not necessarily exclude the use of uncamouflaged lattice, guyed, or monopole Tower designs.~~

~~H. Telecommunications Facilities means any cables, wires, lines, wave guides, antennas, and any other equipment or facilities associated with the transmission or reception of communications which a Person seeks to locate or has installed upon or near a Tower or Antenna Support Structure. However, Telecommunications Facilities shall not include:~~

~~3. Any satellite earth station antenna two (2) meters in diameter or less which is located in an area zoned industrial or commercial; or~~

~~4. Any satellite earth station antenna one (1) meter or less in diameter, regardless of zoning category.~~

~~I. Tower means a self-supporting lattice, guyed, or monopole structure constructed from grade which supports Telecommunications Facilities. The term Tower shall not include amateur radio operators' equipment, as licensed by the FCC.~~

Section 5. ~~17~~**24.02. Development of Towers**.

~~A.~~**1.** Towers are exempt from the maximum height restrictions of the districts where located. Towers shall be permitted to a height of one hundred and fifty (150) feet. Towers may be permitted in excess of one hundred and fifty (150) feet in accordance with "Criteria for Site Plan Development Modifications."

~~B.~~**2.** No new Tower shall be built, constructed, or erected in the County unless the Tower is capable of supporting three other Persons' operating Tele-communications Facilities comparable in weight, size, and surface area to the Telecommunications Facilities installed by the Applicant on the Tower within six (6) months of the completion of the Tower construction. No tower shall charge co-location fees in excess of commercially reasonable industry amounts. Each tower constructed shall upon the request of Codington County mount law-enforcement or public safety communications apparatus.

~~C.~~**3.** An application to develop a Tower shall include:

~~1.~~**a.** The name, address, and telephone number of the Owner and lessee of the parcel of land upon which the Tower is situated. If the Applicant is not the Owner of the parcel of land upon which the Tower is situated, the written consent of the Owner shall be evidenced in the Application.

~~2.~~**b.** The legal description, folio number, and address of the parcel of land upon which the Tower is situated.

~~3~~.**c**.The names, addresses, and telephone numbers of all owners of other Towers or usable Antenna Support Structures within a one-half (½) mile radius of the proposed new Tower site, including County-owned property.

~~4~~.**d**.A description of the design plan proposed by the Applicant. Applicant must identify its utilization of the most recent technological design, including microcell design, as part of the design plan. The Applicant must demonstrate the need for Towers and why design alternatives, such as the use of microcell, cannot be utilized to accomplish the provision of the Applicant's telecommunications services.

~~5~~.**e**.An affidavit attesting to the fact that the Applicant made diligent, but unsuccessful, efforts to install or collocate the Applicant's Telecommunications Facilities on Towers or usable Antenna Support Structures owned by other Persons located within a one-half (½) mile radius of the proposed Tower site. In the event that one reason for the unsuccessful efforts to install or collocate is that fees to be charged are not commercially reasonable, an explanation shall be provided why said charges are commercially reasonable.

~~6~~.**f**.Written technical evidence from an Engineer(s) that the proposed Tower or Telecommunications Facilities cannot be installed or collocated on another person's Tower or usable Antenna Support Structures owned by other Persons located within one-half (½) mile radius of the proposed Tower site.

~~7~~.**g**.A written statement from an Engineer(s) that the construction and placement of the Tower will not interfere with public safety communications and the usual and customary transmission or reception of radio, television, or other communications services enjoyed by adjacent residential and non-residential properties.

~~8~~.**h** Written, technical evidence from an Engineer(s) that the proposed structure meets the standards set forth in, "Structural Requirements," of this Ordinance.

~~9~~.**i**.Written, technical evidence from a qualified Engineer(s) acceptable to the Fire Marshall and the building official that the proposed site of the Tower or Telecommunications Facilities does not pose a risk of explosion, fire, or other danger to life or property due to its proximity to volatile, flammable, explosive, or hazardous materials such as LP gas, propane, gasoline, natural gas, or corrosive or other dangerous chemicals.

~~10~~.**j**.The Act gives the FCC sole jurisdiction of the field of regulation of RF emissions and does not allow the County to condition or deny on the basis of RF impacts the approval of any Telecommunications Facilities (whether mounted on Towers or Antenna Support Structures) which meet FCC standards. In order to provide information to its citizens, the County shall make available upon request copies of ongoing FCC information and RF emission standards for Telecommunications Facilities transmitting from Towers or Antenna Support Structures. Applicants shall be required to submit information on the proposed power density of their proposed Telecommunications Facilities and demonstrate how this meets FCC standards.

~~10~~.**j**.No application shall be accepted from landowners or on property on which there are current or past unresolved violations outstanding.

~~11~~.**k.**The Board of Adjustment may require an Applicant to supplement any information that the Board considers inadequate or that the Applicant has failed to supply. The Board of

Adjustment may deny an Application on the basis that the Applicant has not satisfactorily supplied the information required in this subsection. Applications shall be reviewed by the Board in a prompt manner and all decisions shall be supported in writing setting forth the reasons for approval or denial.

Section 5. ~~17~~24.03. Setbacks.

~~A.~~**1.** All Towers up to one-hundred (100) feet in height shall be set back on all sides a distance equal to the underlying setback requirement in the applicable zoning district.

~~B.~~**2.** Towers in excess of one hundred (100) feet in height shall ~~be set back one (1) additional foot per each foot of Tower height in excess of one hundred (100) feet~~ **meet the following**.

a. Distance from existing off-site residences, business and public buildings shall be one thousand (1,000) feet. Distance from on-site or lessor's residence shall be five hundred (500) feet.

b. Distance from public right-of-way shall be the height of the tower.

c. Distance from any property line shall be the height of the tower.

~~C.~~**3.** Setback requirements for Towers shall be measured from the base of the Tower to the property line of the parcel of land on which it is located.

~~D.~~**4.** Setback requirements may be modified, as provided herein, when placement of a Tower in a location which will reduce the visual impact can be accomplished. For example, adjacent to trees which may visually hide the Tower.

Section 5. ~~17~~24.04. Structural Requirements.

~~A.~~**1.** All Towers must be designed and certified by an Engineer to be structurally sound and, at minimum, in conformance with the Building Code, and any other standards outlined in this Ordinance. All Towers in operation shall be fixed to land.

Section 5. ~~17~~24.05. Separation of Buffer Requirements.

For the purpose of this Section, the separation distances between Towers shall be measured by drawing or following a straight line between the base of the existing or approved structure and the proposed base, pursuant to a site plan of the proposed Tower.

Proposed Towers must meet the following minimum separation requirements from existing Towers or Towers which have a development permit but are not yet constructed at the time a development permit is granted pursuant to this Ordinance:

1. Monopole Tower structures shall be separated from all other Towers, whether monopole, self-supporting lattice, or guyed, by a minimum of seven hundred and fifty (750) feet.

2. Self-supporting lattice or guyed Tower structures shall be separated from all other self-supporting or guyed Towers by a minimum of fifteen hundred (1,500) feet.

3. Self-supporting lattice or guyed Tower structures shall be separated from all monopole Towers by a minimum of seven hundred and fifty (750) feet.

4. The separation requirements contained in 5.24.05 shall not be required of existing Towers or Towers which have a development permit but are not yet constructed at the time a development permit is granted pursuant to this Ordinance.

Section 5.~~17~~24.06. Method Of Determining Tower Height.

1.Measurement of Tower height for the purpose of determining compliance with all requirements of this Section shall include the Tower structure itself, the base pad, and any other Telecommunications Facilities attached thereto which extend more than twenty (20) feet over the top of the Tower structure itself. Tower height shall be measured from grade.

Section 5.~~17~~24.07. Illumination.

1. Towers shall not be artificially lighted except as required by the Federal Aviation Administration (FAA). Upon commencement of construction of a Tower, in cases where there are residential uses located within a distance which is three hundred (300) percent of the height of the Tower from the Tower and when required by federal law, dual mode lighting shall be requested from the FAA.

Section 5.~~17~~24.08. Exterior Finish.

1.Towers not requiring FAA painting or marking shall have an exterior finish which enhances compatibility with adjacent land uses, as approved by the appropriate reviewing body.

Section 5.~~17~~24.09. Modification Of Towers.

~~A.~~**1.**A Tower existing prior to the effective date of this Ordinance, which was in compliance with the Count's zoning regulations immediately prior to the effective date of this Ordinance, may continue in existence as a nonconforming structure. Such nonconforming structures may be modified or demolished and rebuilt without complying with any of the additional requirements of this Section, except for Sections "Separation or Buffer Requirements", "Certification and Inspections", and "Maintenance," provided:

~~1.~~**a**.The Tower is being modified or demolished and rebuilt for the sole purpose of accommodating, within six (6) months of the completion of the modification or rebuild, additional Telecommunications Facilities comparable in weight, size, and surface area to the discrete operating Telecommunications Facilities of any Person currently installed on the Tower.

~~2.~~**b** An Application for a development permit is made to the Board of Adjustment which shall have the authority to issue a development permit without further approval. The grant of a development permit pursuant to this Section allowing the modification or demolition and rebuild of an existing nonconforming Tower shall not be considered a determination that the modified or demolished and rebuilt Tower is conforming.

~~3.~~**c** The height of the modified or rebuilt Tower and Telecommunications Facilities attached thereto do not exceed the maximum height allowed under this Ordinance.

~~B.~~**2.**A Except as provided in this Section, a nonconforming structure or use may not be enlarged, increased in size, or discontinued in use for a period of more than one hundred eighty (180) days. This Ordinance shall not be interpreted to legalize any structure or use

existing at the time this Ordinance is adopted which structure or use is in violation of the Code prior to enactment of this Ordinance.

Section 5. ~~17~~24.10. Certifications And Inspections.

~~A.~~**1.** All Towers shall be certified by an Engineer to be structurally sound and in conformance with the requirements of this ordinance and all other construction standards set forth by federal and state law. For new monopole Towers, such certification shall be submitted with an Application pursuant to of this Ordinance and every five (5) years thereafter. For existing monopole Towers, certification shall be submitted within sixty (60) days of the effective date of this Ordinance and then every five (5) years thereafter. For new lattice or guyed Towers, such certification shall be submitted with an Application pursuant to of this Ordinance and every two (2) years thereafter. For existing lattice or guyed Towers, certification shall be submitted within sixty (60) days of the effective date of this Ordinance and then every two (2) years thereafter. The Tower owner may be required by the County to submit more frequent certifications should there be reason to believe that the structural and electrical integrity of the Tower is jeopardized.

~~B.~~**2.** The County or its agents shall have authority to enter onto the property upon which a Tower is located, between the inspections and certifications required above, to inspect the Tower for the purpose of determining whether it complies with this ordinance and all other construction standards provided by federal and state law.

~~C.~~**3.** The County reserves the right to conduct such inspections at any time, upon reasonable notice to the Tower owner. All expenses related to such inspections by the County shall be borne by the Tower owner.

Section 5. ~~17~~24.11. Maintenance.

~~A.~~**1.** Tower owners shall at all times employ ordinary and reasonable care and shall install and maintain in use nothing less than commonly accepted methods and devices for preventing failures and accidents which are likely to cause damage, injuries, or nuisances to the public.

~~B.~~**2.** Tower owners shall install and maintain Towers, Telecommunications Facilities, wires, cables, fixtures, and other equipment in substantial compliance with the requirements of the National Electric Safety Code and all FCC, state, and local regulations, and in such manner that will not interfere with the use of other property.

~~C.~~**3.** All Towers, Telecommunications Facilities, and Antenna Support Structures shall at all times be kept and maintained in good condition, order, and repair so that the same shall not menace or endanger the life or property of any Person.

~~D.~~**4.** All maintenance or construction of Towers, Telecommunications Facilities, or Antenna Support Structures shall be performed by licensed maintenance and construction personnel.

~~E.~~**5.** All Towers shall maintain compliance with current RF emission standards of the FCC.

~~F.~~**6.** In the event that the use of a Tower is discontinued by the Tower owner, the Tower owner shall provide written notice to the County of its intent to discontinue use and the date when the use shall be discontinued.

Section 5. ~~17.~~24.12. Criteria For Site Plan Development Modifications.

~~A.~~**1.** Notwithstanding the Tower requirements provided in this Ordinance, a modification to the requirements may be approved by the Board of Adjustment as a ~~Special Exception~~ **Conditional use** in accordance with the following:

~~1.~~**a.** In addition to the requirement for a Tower Application, the Application for modification shall include the following:

~~a.~~**i.** A description of how the plan addresses any adverse impact that might occur as a result of approving the modification.

~~b.~~**ii.** A description of off-site or on-site factors which mitigate any adverse impacts which might occur as a result of the modification.

~~c.~~iii**.** A technical study that documents and supports the criteria submitted by the Applicant upon which the request for modification is based. The technical study shall be certified by an Engineer and shall document the existence of the facts related to the proposed modifications and its relationship to surrounding rights-of-way and properties.

~~d.~~**iv.** For a modification of the setback requirement, the Application shall identify all parcels of land where the proposed Tower could be located, attempts by the Applicant to contract and negotiate an agreement for collocation, and the result of such attempts.

~~e.~~**v.** The Board of Adjustment may require the Application to be reviewed by an independent Engineer under contract to the County to determine whether the antenna study supports the basis for the modification requested. The cost of review by the County's Engineer shall be reimbursed to the County by the Applicant.

b. The Board of Adjustment shall consider the Application for modification based on the following criteria:

~~a.~~**i.** That the Tower as modified will be compatible with and not adversely impact the character and integrity of surrounding properties.

~~b.~~**ii.** Off-site or on-site conditions exist which mitigate the adverse impacts, if any, created by the modification.

~~c.~~iii**.** In addition, the board may include conditions on the site where the Tower is to be located if such conditions are necessary to preserve the character and integrity of the neighborhoods affected by the proposed Tower and mitigate any adverse impacts which arise in connection with the approval of the modification.

~~B.~~**2.** In addition to the requirements of subparagraph (A) of this Section, in the following cases, the Applicant must also demonstrate, with written evidence, the following:

~~1.~~**a.** In the case of a requested modification to the setback requirement, that the setback requirement cannot be met on the parcel of land upon which the Tower is proposed to be located and the alternative for the Person is to locate the Tower at another site which is closer in proximity to a residentially zoned land.

~~2.b.~~**b.** In the case of a request for modification of the separation and buffer requirements from residential use of land of , if the Person provides written technical evidence from an Engineer(s) that the proposed Tower and Telecommunications Facilities must be located at the proposed site in order to meet the coverage requirements of the Applicant's wireless communications system and if the Person is willing to create approved landscaping and other buffers to screen the Tower from being visible to residentially used property.

~~3.c.~~**c.** In the case of a request for modification of the height limit for Towers and Telecommunications Facilities or to the minimum height requirements for Antenna Support Structures, that the modification is necessary to:

~~a.~~**i.** facilitate collocation of Telecommunications Facilities in order to avoid construction of a new Tower; or

~~b.~~**ii.** To meet the coverage requirements of the Applicant's wireless communications system, which requirements must be documented with written, technical evidence from an Engineer(s) that demonstrates that the height of the proposed Tower is the minimum height required to function satisfactorily, and no Tower that is taller than such minimum height shall be approved.

Section 5. ~~17.20~~**24.13. Abandonment.**

~~A.~~**1.** If any Tower shall cease to be used for a period of **three hundred sixty-five** (365) consecutive days, the Codington County Planning Commission shall notify the Owner, with a copy to the Applicant, that the site will be subject to a determination by the Codington County Planning Commission that such site has been abandoned. The Owner shall have thirty (30) days from receipt of said notice to show, by a preponderance of the evidence, that the Tower has been in use or under repair during the period. If the Owner fails to show that the Tower has been in use or under repair during the period, the Codington County Planning Commission shall issue a final determination of abandonment for the site. Upon issuance of the final determination of abandonment, the Owner shall, within seventy-five (75) days, dismantle and remove the Tower.

~~B.2.~~ To secure the obligation set forth in this Section, the Applicant [and/or Owner] may be required to post a bond.

CHAPTER 5.25. SOIL EROSION AND SEDIMENTATION CONTROL.

1. Before issuing a building permit, the Zoning Officer may require a filing of a certificate of intent to adhere to the county soil loss standards developed by the Codington County Conservation District. The Zoning Officer shall consult the Codington County Soil Erosion and Sedimentation Control Ordinance that was developed pursuant to SDCL 38-8A before determining if the proposed activity requires such a certificate of intent.

2. If a complaint is received regarding a violation of the county soil loss standards caused by non-agricultural activity, the Zoning Officer shall undertake those actions outlined herein in order to bring about compliance.

CHAPTER 5.26. MINERAL EXPLORATION AND DEVELOPMENT.

Separate permits are required for mineral extraction and milling. The applicant for a permit must meet the following minimal conditions as they pertain to the permit for which application is made.

1. The applicant shall provide:

a. A description of the mineral or minerals which are the subject of the mining or milling.

b. Maps showing the general area within which the mining or milling operation will be conducted.

c. A detailed description of the regional environmental conditions, to include surface land use and vegetation as well as a detailed description of the area's geologic formations and hydrology from the best available scientific sources are required for mining or milling permits.

d. An environmental assessment which establishes base line conditions for radioactive and toxic material in air, ground and surface water, soil, vegetation and animals is required for mining or milling permits.

e. The applicant shall provide maps indicating the location of the affected sites to the nearest section of land, a technical description of the mining or milling process, the types of equipment to be used, and the estimated timetable for each phase of work and for final completion of the program.

f. A description of the major environmental impacts upon air quality, water quality and quantity, and land use modification presented by the proposed mining or milling.

g. A description of the proposed plan to address the identified environmental impacts to include all measures to be taken to prevent soil erosion, water contamination, air contamination, disruption of the area's ecological balance and any other related hazard to public health and safety.

2. The applicant shall provide for a plan for land reclamation of the land after mining is completed. Measures to be taken for surface reclamation shall take into account the impact on adjacent land uses and natural resources, and the proposed future use of the lands mined and adjacent lands. The reclamation plan shall include:

a. A reclamation schedule.

b. Methods of plugging drill holes.

c. Methods of severing and returning topsoil and subsoil.

d. Methods of grading, backfilling and contouring of exploration sites, access roads, and mining sites.

e. Methods of waste management and disposal, including liquid and solid wastes.

f. Method of revegetation.

The applicant may be required to post a surety performance bond in an amount to be determined by the County Commission to assure that sufficient funds will be available to carry out required reclamation and, if necessary, decontamination of affected ground and surface waters. The amount shall be set by the County Commission based on an estimate of the cost of reclamation and decontamination. The bond shall be released five (5) years after mining and milling has ceased unless the Commissioners find, for good cause shown, that the water quality of the affected area has not been restored or the reclamation plan has not been completed. The amount of the surety bond may be reduced by the Commissioners if a bond is held by the State of South Dakota for the same purpose, by the same amount of the latter bond.

3. **The applicant shall identify specific phases when monitoring and inspection of the mining and milling activities shall be conducted by County, State, or Federal personnel or their representatives to assure compliance with all applicable rules and regulations. If the special use permit is granted, the permit shall identify such inspection and it shall be the responsibility of the applicant to notify said agency when monitoring or inspection is required. The applicant shall bear the burden of the cost of the monitoring and inspection program as determined by the Planning and Zoning Commission.**

4. **A conditional use permit shall be issued only after all conditions specified herein have been met. Evidence of violation of the regulations, including but not limited to air and water contamination, shall be cause for an immediate cessation of mining and milling activities.**

CHAPTER 5.27 AGRICULTURAL EASEMENT.

The following easement is to be utilized as required for farm and non-farm residential development within the Agricultural, Lake Park and Planned Residential Districts. **(See 3.04.03.9.a)**

Prepared by:
Codington County Zoning Officer (or by Grantor or Grantor's Attorney)
1910 West Kemp Avenue (or Grantor's or Grantor's Attorney's address)
Watertown, SD 57201 (or Grantor's or Grantor's Attorney's city)

~~MODEL~~ AGRICULTURAL EASEMENT

1. Purpose. This easement is required in the Agricultural District.

2. Easement.

   ("Grantors") are the owners of real property described as follows:

   _____

   _____

In accordance with the conditions set forth in the decision of Codington County, dated _____ 20____, approving a permit for a dwelling on the above described property, and in consideration of such approval, Grantors grant to the owners of all property adjacent to the above described property, a perpetual nonexclusive easement as follows:

a. The Grantors, their heirs, successors, and assigns acknowledge by the granting of this easement that the above described property is situated in an agricultural area and may be subjected to conditions resulting from commercial agricultural operations on adjacent lands. Such operations include the cultivation, harvesting, and storage of crops and livestock raising and the application of chemicals, operation of machinery, application of irrigation water, and other accepted and customary agricultural activities conducted in accordance with Federal and State laws. These activities ordinarily and necessarily produce noise, dust, smoke, and other conditions that may conflict with Grantors' use of Grantors' property for residential purposes. Grantors hereby waive all common law rights to object to normal and necessary agricultural management activities legally conducted on adjacent lands which may conflict with Grantors' use of Grantors' property for residential purposes, and Grantors hereby grant an easement to adjacent property owners for such activities.

b. Nothing in this easement shall grant a right to adjacent property owners for ingress or egress upon or across the described property. Nothing in this easement shall prohibit or otherwise restrict the Grantors from enforcing or seeking enforcement of statutes or regulations of governmental agencies for activities conducted on adjacent properties.

This easement is appurtenant to all property adjacent to the above described property and shall bind to the heirs, successors and assigns of Grantors and shall endure for the benefit of the adjoining landowners, their heirs, successors, and assigns. The adjacent landowners, their heirs, successors, and assigns are hereby expressly granted the right of third party enforcement of this easement.

IN WITNESS WHEREOF, the Grantors have executed this easement on _____, 20____.

_____
Signature, Grantor

STATE OF SOUTH DAKOTA
SS:
COUNTY OF CODINGTON

This instrument was acknowledged before me on _____, 20____ by _____ (Grantors).

_____Notary Public

My Commission Expires: _____

CHAPTER 5.~~19~~28. Range Requirements.

~~5.19.1 Definitions.~~

~~1. Archery Ranges are included as Ranges.~~

~~2. Firearm means a gun that discharges shot, bullet or other projectile by means of an explosive, gas, compressed air, or other propellant.~~

~~3. Range Officer means the person designated to be responsible at a Range at any given time during any activity.~~

~~4. A Range shall be defined as an area for the discharge of weapons for sport under controlled conditions where the object of the shooting is an inanimate object such as, but not limited to, paper, metal or wooden targets. A Range Officer shall be present on site at any Range when the range is in use.~~

Section 5.~~19~~28.0~~2~~1. Conditional Use Permits.(Added by Ord. #18, moved by Ord. #30)

No Range shall be established within the Codington County without first obtaining a ~~Special Exception~~ Conditional Use Permit.

Section 5.~~19~~28.0~~3~~2 General Regulations for All Ranges.

No ~~Special Exception~~ Conditional Use Permit shall be approved for any Range unless all of the following conditions are met (unless specifically waived by the Board of Adjustment):

1. A safety plan shall be submitted along with the application. The plan, once approved, shall be posted in a prominent place at the site. Any changes to the safety plan shall be submitted to the County Board of Adjustment for approval. At a minimum the safety plan must state:

    a. A method of identifying the Range Officer when the Range Officer is present at the site. Additionally, a permanent log identifying the Range Officer who is present when required at the facility must be maintained and available for inspection by the County or local law enforcement officers.

    b. The authority of Range Officers to carry out the rules and regulations on the site and to enforce penalties.

    c. The policy for the site for the use of alcohol.

    d. Controlled substances are prohibited on the site.

    e. Rules for the safe handling of weapons.

    f. A building and grounds maintenance plan.

    g. Administrative Rules to include regulations that normally govern range schedules, parking, guest policies, member/user responsibilities, hours of operation, security, program development, range supervision and other items such as sign-in procedures.

    h. Regulations on the type of weapon, shooting activity, caliber, shot size or type of target to ensure safety for range users and others.

i. The penalties that are in force for violations of the safety plan.

j. The method used to control trespass or unauthorized access to the range or preserve.

2. On an annual basis, applicants must provide proof of insurance.

3. Applicants shall continuously keep the City informed as to the current names and telephone numbers of the officers of any organization having an interest in the Range. Any changes to the names or telephone numbers of the officers shall be reported to the County within thirty (30) days of the change.

4. All Ranges must control entrance to their sites.

5. No alcohol licenses shall be granted to any site which has a Range.

6. Parking space for all members, owners or guests must be on-site and is not allowed on public streets or roads.

Section 5.~~19~~28.043 Special Regulations for Ranges. Applications for all Ranges, in addition to any other requirements of this Ordinance, must also show:

1. A survey delineating the layout of all individual Ranges.
2. Setbacks to all property lines.

3. Method of containing projectiles within each individual range (such as earthen berms or other method).

4. Methods to be employed to reduce noise, including impulse noise.

a. The maximum noise that may escape the range into areas not controlled by the owner is 125 dB.

5. All Ranges shall be designed using the NRA Range Source Book as a guideline.

Section 5.~~19~~28.05~~4~~ Application Requirements. Each application for a Range shall, at a minimum, include the following:

1. A description of specific activities to be conducted on-site.

2. The hours and days of operation.

3. The maximum number of people using the facility at any one time.

4. A plan, if applicable, for collecting and recycling used shot.

5. A delineation of any special events, if any.

6. A sewage, water and solid waste management plan.

Section 5.~~19~~28.06~~5~~ Area Regulations.

1. Minimum Lot Size: Ten (10) acres

2. Minimum Front Yard: One hundred fifty (150) feet

3. Minimum Side Yard: Three hundred (300) feet

4. Back of the Range Setback: A minimum of one thousand (1000) feet from any buildings and/or roads.

5. Setback from Residences: One-quarter (1/4) mile to be measured from the firing line to the nearest residential dwelling.

6. Setback from Commercial Uses: One-quarter (1/4) mile to be measured from the firing line to the nearest commercial structure.

7. Setback from Churches and Schools: One-quarter (1/4) mile to be measured from the firing line to the nearest church or school.

8. Setback from Municipalities: Three (3) miles to be measured from the firing line to the corporate limits of the municipality.

Section 5.~~19~~28.0~~7~~6. Miscellaneous Regulations.

1. In the event that any provision of this Ordinance or the ~~Special Exception~~ Conditional Use Permit is violated, or the County otherwise reasonably believes that the health, safety or general welfare of the public is endangered by the use, or if the County reasonably believes that a public nuisance has been created, then, upon ten (10) days written notice, the County may originate action to either modify or cancel any ~~Special Exception~~ Conditional Use Permit.

~~Chapter 5.29. Waiver of Setback from Existing Concentrated Animal Feeding Operation~~ (Chapter 5.29 Amended by Ord. #64)

CHAPTER 5.29. SINGLE FAMILY DWELLING (FARM OR NON-FARM) CONSTRUCTED LESS THAN ONE-HALF (1/2) MILE FROM AN EXISTING CONCENTRATED ANIMAL FEEDING OPERATION

Section 5.29.01. Single family dwelling (farm or non-farm) Constructed Less than One-Half (1/2) Mile from an existing Concentrated Animal Feeding Operation as a Conditional Use.

Applicants for a Single family dwelling (farm or non-farm) proposed to be constructed less than one-half (1/2) mile from an existing concentrated animal feeding operation may obtain a conditional use permit provided one of the following conditions is met:

1. Applicant obtains a written waiver from the owner/operator of any existing concentrated animal feeding operation which is closer than one-half (1/2) mile from the proposed residential building site.

2. Applicant files a document consistent with Section 5.29.02 with the Register of Deeds acknowledging the existence of a concentrated animal feeding operation less than

one-half mile from the proposed building site at the time of application for a building permit. Exception: This requirement does not apply to lots of record with existing residential development that are destroyed by an act of God (wind, fire, flood) and subsequently are rebuilt.

Section 5.29.02. Acknowledgement of Existing Concentrated Animal Feeding Operation

The following ~~waiver~~ acknowledgement is to be utilized as required for a conditional use permit in Section 5.29.01 for farm and non-farm residential development in the Agricultural District which is located within one-half (1/2) mile of an existing concentrated animal feeding operation.

Prepared by:
Codington County Zoning Officer (or by Grantor or Grantor's Attorney)
1910 West Kemp Avenue (or Grantor's or Grantor's Attorney's address)
Watertown, SD 57201 (or Grantor's or Grantor's Attorney's city)

ACKNOWLEDGEMENT OF ~~WAIVER OF SETBACK FROM~~
EXISTING CONCENTRATED ANIMAL FEEDING OPERATION

The following ~~waiver~~ acknowledgement is to be used when a dwelling (Farm or Non-Farm) is proposed to be constructed within one-half (1/2) mile of an existing Concentrated Animal Feeding Operation. The ~~waiver~~ acknowledgement shall be filed with the Register of Deeds. Grantors are the owner(s) of property applying for the proposed residential development. (See ~~3.04.03.9.b~~ 3.04.02.41 and 5.29.01.2)

1. Purpose. This ~~waiver~~ acknowledgement is required for any dwelling to be constructed within one-half (1/2) mile of an existing concentrated animal feeding operation as defined by the Codington County Zoning Ordinance.

2. Waiver:

("Grantors") are the owners of real property described as follows:
_____
In accordance with the conditions set forth in the decision of Codington County, dated _____ 20____, approving a plat with a residential dwelling development right or by the issuance of a permit for a residential dwelling either to be located within one-half (1/2) mile of the existing concentrated animal feeding operation located at the following property,
_____
and in consideration of such approval, Grantors ~~agree to the perpetual non-exclusive easement as follows~~ acknowledge the following:

1. The Grantors, their heirs, successors, and assigns acknowledge that the location of a residential development/dwelling on (legal description) is within one-half (1/2) mile of an existing concentrated animal feeding operation. ~~This easement waives the Grantors, their heirs, successors, and assigns common law rights to object to the existing concentrated animal feeding operation's, located at the above legal description, potential need for a variance from the setback requirements of the Codington County Zoning Ordinance.~~

2. ~~Further, t~~The grantors hereby ~~waive all common law rights to appeal any decision of Codington County Board of Adjustment relating to the issuance of a variance regarding separation setbacks from the existing concentrated animal feeding operation located at above legal description.~~ acknowledge that the construction of this residence will not result in the existing concentrated animal feeding operation becoming a nonconforming use as defined by the Codington County Zoning Ordinance.

IN WITNESS WHEREOF, _____, 20__

Grantors (Print) _____

Grantors (Signature) _____

STATE OF SOUTH DAKOTA
_____ SS:
COUNTY OF CODINGTON

This instrument was acknowledged before me on _____, 20____ by _____ (Grantors).

_____ Notary Public

My Commission Expires: _____

CHAPTER 5.30. ADULT USE REGULATIONS.

In the development and execution of these regulations, it is recognized that there are some uses which because of their very nature, are recognized as having serious objectionable operational characteristics, particularly when several of them are concentrated under certain circumstances thereby having a deleterious effect upon the adjacent areas. Special regulation of these uses is necessary to ensure that these adverse effects will not contribute to the blighting or downgrading of the surrounding neighborhood. These special regulations are itemized in this section. The primary control or regulation is for the purpose of preventing a concentration of these uses in any one area.

Section 5.30.01 Setbacks.

1. None of the following uses may be established, operated or maintained within one thousand (1,000) feet of a residence, a church, a school meeting all the requirements of the Compulsory Education Laws of the State of South Dakota, or a public park.

   a. Adult bookstore.

   b. Adult motion picture theater.

   c. Adult photo studio.

   d. Adult Entertainment Facility.

e. Any use which has as a part of its operation an adult use component including but not limited to, a restaurant or eating place, a bar, lounge or tavern.

f. Any use intended to provide adult amusement or entertainment.

2. Not more than two of the following uses may be established, operated or maintained within one thousand (1,000) feet of each other:

a. Adult bookstore.

b. Adult motion picture theater.

c. Adult photo studio.

d. Adult entertainment facility.

e. Any use which has as a part of its operation an adult use component including but not limited to, a restaurant or eating place, a bar, lounge or tavern.

f. Any use intended to provide adult amusement or entertainment.

g. A bar.

h. A liquor store.

3. The 1,000-foot restriction provided for in 5.30.01.2 above may be waived and a conditional use permit issued upon proper application if the Board of Adjustment finds:

a. That the proposed use will not be contrary to the public interest or injurious to nearby properties and that the spirit and intent of these regulations will be observed.

b. That the proposed use will not enlarge or encourage the development of a 'skid row' area.

c. That all applicable regulations will be observed.

Section 5.30.02. Required License.

It shall be unlawful for any person to engage in the business of operating an adult use in Codington County without first having obtained a license from the Codington County Commissioners.

Section 5.30.03 Application; Standards for Issuance.

1. Application for an adult use license shall be made in writing and shall state the following:

a. The name, address, telephone number and age of the applicant and the registered agent of the applicant if the applicant is a corporation.

b. The location of the adult use business.

c. The exact nature of the adult use to be conducted and of the proposed place of business and the facilities related thereto.

d. A statement by the applicant that he is familiar with the provisions of this article and is in compliance with them.

e. A statement of whether the business will be conducted by a manager and, if so, the name, address, telephone number, and age of each such manager.

f. A statement that no manager or principal operating the business has been convicted of any offense of prostitution, soliciting for prostitution, or obscenity or public indecency as defined in the South Dakota Compiled Statutes within the last two (2) years, and that the applicant has not had any license for an adult use in any other community revoked within the last two (2) years.

2. Within fifteen (15) days after receipt of an application for an adult use license, the Codington County Commissioners shall investigate the information contained in the application and shall determine the following:

a. That the premises designated by the applicant as the location of the business are in full compliance with all applicable ordinances of Codington County, including zoning ordinances.

b. That the premises and each manager and employee comply with the provisions of Section 5.30.03.1 as such provisions apply to them.

c. That the applicant, each manager and each employee are over twenty-one (21) years of age.

d. That no manager or principal operator of the business has been convicted of any offense of prostitution, solicitation for prostitution, or obscenity or public indecency, as defined in the South Dakota Compiled Statutes within the last two (2) years, and that the applicant has not had any license for an adult use revoked within the last two (2) years.

3. If the investigation shows the compliance of the applicant for an adult use license, the premises upon which the business is to be conducted and each manager and employee, if applicable, with each of the requirements established in subsections (1) and (2) of this section, and with the conditions and regulations set forth in Section 5.30.03 within fifteen (15) days after completion of such investigation, the Codington County Commissioners shall issue a license, and upon payment by the applicant of the license fee required under this article, the license shall be issued.

4. If the investigation shows that the applicant for an adult use license, the premises on which the business is to be conducted, or the managers and employees, if applicable, do not comply with each of the requirements established in subsection (1) of this section, and with the conditions and regulations set forth in Section 5.30.03 within fifteen (15) days after completion of such investigation, the Codington County Commissioners shall notify the applicant in writing that the license has been denied. Such denial shall be the final administrative action of the County with respect to the

license application, and shall be subject to the immediate appeal by the applicant to the circuit court.

Section 5.30.04. Conditions & Regulations Governing Operation; Violation; Penalty.

1. The following regulations shall govern and control the business of operating an adult use in Codington County:

   a. No person under twenty-one (21) years of age shall be allowed on the licensed premises.

   b. At all times during the hours of operation there shall be present a manager or other employee of the licensee who shall be not less than twenty-one (21) years of age.

   c. Upon a change of any manager conducting business for the licensee, the licensee shall, within ten regular business days, give the County Commissioners written notice of such change by actual delivery or by registered or certified mail. The licensee shall, thereafter, as promptly as practicable, but in any event within five (5) regular business days, provide the information concerning the new manager which is required in Section 5.30.03.

   d. No adult use shall be located on-premises for which a license to sell alcoholic liquor has been issued, and no alcoholic liquor shall be permitted on such premises.

   e. No adult use shall be permitted unless the premises on which such business is located complies with the requirements of the zoning ordinance.

   f. No licensee or manager under the provisions of this article shall knowingly permit any person to remain in or upon licensed premises who commits any act of public indecency or obscenity as defined in the South Dakota Compiled Statutes.

   g. No licensee or manager under the provisions of this article shall permit any act of prostitution, solicitation for prostitution or patronization of a prostitute on the licensed premises.

   h. No sign shall be posted on the licensed premises which depicts, displays or refers to specified anatomical areas or specified sexual activities, as defined in this article.

2. In addition to the requirements established in Section 5.30.04.1, the following regulations shall govern and control the operation of an adult bookstore which offers any films or videotapes for viewing on-premises by use of motion picture devices or other such operations means:

   a. All viewing areas, which shall be defined as the area where a patron or customer would ordinarily be positioned while watching a film or viewing device, shall be visible from a continuous main aisle or public room and shall not be obscured by any curtain, door, wall or other enclosure.

b. There shall be no aperture whatsoever in any wall or partition between viewing areas.

c. Each viewing area shall be lighted at a minimum level of ten (10) foot candles in all parts thereof.

3. In addition to the requirements established in Section (1) of this section, the following regulations shall govern and control the operation of an adult entertainment cabaret:

a. All performers shall be at least twenty-one (21) years of age.

b. All performances, exhibitions or displays shall take place on a platform raised at least two feet from the level of the floor, and located at least ten (10) feet from any patron.

c. No performer shall fondle or caress any patron or other performer and no patron shall fondle or caress any performer.

d. No patron shall be permitted to pay or give any gratuity to any performer, and no performer shall solicit any pay or gratuity from any patron.

4. It shall be unlawful for any person licensed to engage in the business of operating an adult use within the County to fail to comply with the conditions and regulations set forth in subsections 5.30.03 and 5.30.04 of this section as they are applicable to the licensed business, or to suffer or permit noncompliance with such conditions and regulations on or within the licensed premises. In this regard, any act or omission of an employee shall be deemed the act or omission of the owner if such act or omission occurred either with the authorization, knowledge or approval of the owner or as a result of the owner's negligent failure to supervise the employee's conduct. All conduct occurring while on the premises shall be presumed to be the responsibility of the owner.

5. Any person convicted of a violation of this section shall be subject to a fine pursuant to Section 1.02.03 of this Ordinance.

Section 5.30.05 Suspension or Revocation.

Nothing in the terms of this article shall preclude the right of the Codington County Commissioners to suspend or revoke the license of the licensee, as follows:

1. The Codington County Commissioners may temporarily suspend any license issued under the terms of this article when he has reason to believe that the continued operation of a particular licensed premises will immediately threaten the welfare of the community or create an imminent danger of violation of applicable law. In such case, he may, upon the issuance of a written order stating the reason for such determination, and without notice or hearing, order the licensed premises closed for not more than seven (7) days; provided, that the licensee shall be given an opportunity to be heard in a public hearing during the seven (7)-day period, and further provided that if such licensee shall also be engaged in the conduct of other business on the licensed premises, such order shall not be applicable to such other businesses.

2. The Codington County Commissioners may suspend or revoke any license issued under the terms of this article upon ten (10) days notice to the licensee of the time and place of a public hearing, and a public hearing at which the licensee may appear and present evidence, if the Codington County Commissioners determines upon such hearing that the licensee has failed or refused to comply with the terms of this article, has failed or refused to comply with other law applicable to the business of operating an adult use, has knowingly permitted the failure of any manager or employee on the premises to comply with the terms of this article or with other law applicable to the business of operating an adult use, has knowingly furnished false or misleading information on any application required for any license under this section or has suffered or caused another to furnish or withhold such information on his behalf, or has been convicted by a court of competent jurisdiction of a violation of any provision of this section.

5.30.06 Exception.

1. The above language of 5.30 "Adult Use Regulations" adopted April 25, 2006, hereby does not apply to the following legal description: OL 2 SE 1/4 less H-1 E 1/2 SE 1/4 less S 105' W 110' Section 6-116-52 and/or business currently known as "The South Fork Lounge".

Chapter 5.31. PRIVATE WIND ENERGY CONVERSION SYSTEMS (PWECS). The regulations regarding Private Wind Energy Conversion Systems (hereafter referred to as PWECS) shall be as follows:

1. Limited Use. No PWECS installed in accordance with the requirements of these regulations shall generate power as a commercial enterprise as defined by the Public Utility Commission.

2. Setback Requirements. The minimum distance between the property line, overhead utility lines or another wind turban, and any tower support base of a PWECS shall be equal to the proposed tower height (plus the radius of the rotor for the horizontal access machines).

3. Contiguous property owners and planned developments may construct a PWECS for their use in common. If property held by more than one (1) single owner is used to meet the setback requirements, a site plan establishing easements or reserved areas must be submitted to the Board of Adjustment for their approval.

4. Tower Access. Climbing access to the PWECS tower shall be limited either by means of a fence six (6) feet high around the tower base with a locking portal, or by limiting tower climbing apparatus so there is access to it no lower than twelve (12) feet from the ground.

5. Electromagnetic Interference. If a PWECS is installed in any location along or within the major access of an existing microwave communications link, the person desiring to install the PWECS shall be required to provide a letter from the business whose link they are within or adjacent to stating that the business whose link is affected would have no objection to the installation of the PWECS.

6. Air Space. A PWECS shall be located or installed in compliance with the guidelines of the Federal Aviation Administration Regulations with regard to Airport Approach Zones and clearance around VOR stations.

7. Interconnect. The PWECS, if interconnected to an electric utility distribution system, shall meet the interconnect requirements of the electric utility company.

Chapter 5.32 Religious Conference Facility Standards.

Section 5.32.01. Requirements

1. Religious Conference Facilities shall comply with the following conditions:

   a. Religious Conference Facility's buildings and activities shall be set back no less than 300) feet from any off-site residential use.

   b. A Religious Conference Facility shall contain a minimum lot area of twenty-five (25) acres.

   c. A Religious Conference Facility shall be owned and operated by a 501(c) 3 non-profit organization.

   d. Religious Conference Facilities shall be designed in a manner which will minimize the impact of traffic, noise and glare on the surrounding uses.

   e. Religious Conference Facilities must have access to a concrete or bituminous-asphalt street. Further all interior streets constructed within the Religious Conference Facility shall be either concrete or asphalt with the design to be approved by the County Highway Superintendent.

   f. Religious Conference Facilities are not allowed over the shallow aquifer or wellhead protection areas. EXCEPTION: A Religious Conference Facility may be allowed over a shallow aquifer if the proposed Religious Conference Facility utilizes a Board of Adjustment approved central sanitary sewer collection system, which may consist of holding tanks, trunk lines, lift stations, and/or treatment facilities.

   g. Easements per 3.04.03.9 of this ordinance shall be required to be placed on a Religious Conference Facility in order to protect agricultural operations or practices in the adjoining areas.

   h. A site plan shall be submitted including the interior layout of the building and exterior design of the premises.

   i. On-premise signage: The number, size and illumination standards shall be determined by the Board of Adjustment.

   j. Sleeping and dining facilities shall be registered with the South Dakota Department of Health and provide a smoke detector in each sleeping room.

   k. The length of stay of any registered guest shall not exceed thirty (30) days during any 120-day consecutive period.

l. Campgrounds associated with Religious Conference Facilities shall comply with the following conditions:

i. Each campsite shall contain at least two thousand (2,000) square feet.

ii. The campground(s) shall be supplied with a water supply and sewage disposal facilities, including washing, toilets, and similar facilities, and all of which shall meet all applicable State and County codes and regulations.

iii. Access roads shall be provided to each campsite and all access roads shall have a minimum unobstructed width of fourteen (14) feet for all one-way roads, and twenty (20) feet for all two-way roads.

iv. Campsites shall be used by the same persons as temporary/seasonal stays only.

v. No manufactured homes shall be located in any campground.

vi. Religious Conference Facilities shall keep accurate records as to the length of time a person stays in the campground, and shall make said records available to the Zoning Officer upon request.

2. In addition to the following information, plans shall be drawn to scale and shall be of sufficient clarity to indicate the location, nature, and extent of the work proposed and show in detail that it will conform to the provisions of this chapter and all other relevant laws, ordinances, rules and regulations. The Zoning Officer may waive the submission of plans if the nature of the work applied for is such that reviewing of plans is not necessary to obtain compliance with this chapter. The site plan shall contain the following:

a. The address of the property and the legal description.

b. The name of the project and/or business.

c. The scale and north arrow.

d. All existing and proposed buildings or additions.

e. Dimensions of all buildings.

f. Distance from all building lines to the property lines at the closest points.

g. Building height and number of stories.

h. Dimensions of all property lines.

i. Parking lots or spaces; designate each space, give dimensions of the lot, stalls and aisles.

j. Screening; show height, location and type of material to be used.

k. The landscaped setback and trees; indicate species of trees and material to be used for landscaping.

l. Name and location of all adjacent streets, alleys, waterways and other public places.

m. Proposed grading and drainage pattern.

n. Proposed interior circulation pattern indicating the status of street ownership.

o. **Proposed open space uses;**

p. **Utility (water, sewer, electricity, etc.) plans.**

q. **Relation of the proposed development to the surrounding area and comprehensive plan.**

r. **Phasing plan for development.**

3. **Approved plans shall not be changed, modified, or altered without authorization from the Board of Adjustment giving final approval, and all work shall be done in accordance with the approved plans.**

~~SECTION VI~~
~~GENERAL PROVISIONS AND ENFORCEMENT~~

~~6.1 REQUIREMENTS FOR CHANGE~~

~~Whenever the public necessity, safety, and general welfare or good zoning practices justify such action, and after consideration and recommendation by the County Planning Commission as provided herein, the Board of County Commissioners may change zone district boundaries or the regulations established by this Ordinance.~~

~~6.2 ZONING AMENDMENTS~~

~~Whenever the public necessity, safety, and general welfare or good zoning practices justifies such action, and after consideration and recommendation by the County Planning and Zoning Commission, as provided herein, the Board of County Commissioners may change zoning district boundaries, use groups, or the regulations established by this ordinance. A proposed change of zoning district boundaries or regulations may be initiated by the Board of County Commissioners, the Codington County Planning and Zoning Commission, or by application of one or more of the owners of property within the area requested to be changed. However, no such action may be taken until after a public hearing in relation thereto, at which parties in interest and citizens shall have an opportunity to be heard. Notice of the time and place of such hearing shall be published once ten (10) days prior to the date of the meetings as provided in South Dakota Compiled Laws Chapter 11-2, and its and Amendments. Unless otherwise provided for in these regulations, any change in these regulations, shall require Board of County Commissioners approval of an ordinance describing said changes. The Board of County Commissioners may not consider said ordinance until the Planning and Zoning Commission has delivered a recommendation to either approve or not approve said ordinance amendment.~~

~~The following procedure for requesting a Zoning Amendment or Zoning District Boundary Change shall be followed:~~

~~1. The landowner or other person(s) requesting the Amendment/Boundary change shall complete an application, available from the Zoning Officer. Completed applications shall be returned to the Zoning Officer for review. To be considered by the Planning and Zoning Commission and Board of County Commissioners, the application form shall be completed and shall be accompanied by the following items:~~

~~A. Any required attachments and fees, including Registered or Certified Mail costs in~~

Section 6.6; and

B. Any additional information, as requested by the Zoning Officer, as lawfully may be required to determine conformance with and provide for enforcement of this ordinance.

C. The Zoning Officer shall review the application, and shall forward a summary of the application, and his/her comments regarding said application, to the Planning and Zoning Commission for their review.

D. The Zoning Officer shall set the date, time, and place for a joint public hearing to be held by the Planning and Zoning Commission and Board of County Commissioners. The Zoning Officer shall publish notice of the public hearing in a newspaper of general circulation in the area affected by the proposed amendment; such notice shall be published not less than ten (10) days prior to the public hearing. If the proposed amendment will change the boundaries of a zoning district, the Zoning Officer shall notify all owners of property within 250 feet of the proposed boundary change, by Registered or Certified Mail at the expense of the applicant, at least one week before the public hearing.

E. The public hearing shall be held. Any person may appear in person, or by agent or attorney. Minutes of the public hearing shall be recorded and kept in the records of the Planning and Zoning Commission.

F. The Planning and Zoning Commission shall either recommend or not recommend approval of the amendment to the Board of County Commissioners.

G. The Board of County Commissioners shall either approve or not approve the ordinance describing the proposed changes to these zoning regulations, in accordance with standard procedures for reading, approval, publication, and effective date.

H. When the Board of County Commissioners approves a proposed amendment affecting the zoning classification of property, affected property owners may file a written protest to stop such an amendment from taking effect. If the protest meets the following standard, such amendment shall not become effective unless the amendment is approved by two-thirds (4 votes) of the Board of County Commissioners.

Protest Standard: The protest shall be signed by at least 40% of the owners of equity in the parcels in the area affected by the amendment, and the parcels or parts of parcels within 250 feet of the area affected by the amendment.

6.3 OFFICIAL ZONING MAP

Section 6.3.1 Official Zoning Map.

The County is hereby divided into zones, or districts, as shown on the Official Zoning Map which, together with all explanatory matter thereon, is hereby adopted by reference and declared to be a part of this Ordinance.
The Official Zoning Map shall be identified by the signature of the Chairperson of the Board of County Commissioners attested by the County Auditor and bearing the seal of the County under the following words: "This is to certify that this is the Official Zoning Map referred to in Chapter 6.3 of Ordinance Number 15 of Codington County, State of South Dakota," together with the

date of the adoption of this Ordinance. The Official Zoning Map shall be on file at the office of the County Auditor.

Regardless of the existence of purported copies of the Official Zoning Map which may from time to time be made or published, the Official Zoning Map, which shall be located in the office of the County Auditor Offices, shall be the final authority as to the current zoning status of land and water areas, buildings, and other structures in the County.

Section 6.3.2 Amendment of the Official Zoning Map

If, in accordance with the provisions of this Ordinance changes are made in district boundaries or other matter portrayed on the Official Zoning Map, such changes shall be entered on the Official Zoning Map promptly after the amendment has been approved by the Board of County Commissioners, and has become law according to the statutes of the State of South Dakota. No amendment of this Ordinance which involves matter portrayed on the Official Zoning Map shall become effective until after such change and entry has been made on the Official Zoning Map.

No changes of any nature shall be made on the Official Zoning Map or matter shown thereon except with conformity with the procedure set forth in this Ordinance. Any unauthorized change of whatever kind by any person or persons shall be considered a violation of this Ordinance and punishable as provided by this Ordinance.

6.4 FEE SCHEDULE

The Board of County Commissioners shall establish a schedule of fees, charges, and expenses and a collection procedure for building permits, re-zonings, and other matters pertaining to this ordinance. The schedule of fees shall be posted in the office of the Zoning Administrator, and may be altered or amended only by the Board of County Commissioners.

SECTION VII
ADMINISTRATION

7.1 ENFORCEMENT

The Board of County Commissioners shall appoint a Zoning Officer to enforce the provisions of Ordinance. It shall be his duties to enforce all applications for permits, issue permits only for construction and uses which are in accordance with the requirements of this Ordinance, record and file all applications for permits with an accompanying plan and documents, and make such reports as the Commissioners may require. Permits for construction or uses which are a special exception or variance to requirements of this Ordinance shall be issued by the Board of Adjustment.

7.2 CONSTRUCTION UNDERWAYS

Nothing herein contained shall require any change in plans or construction of a lawful use, the construction of which is started before the effective date of this Ordinance and which is completed within one (1) year of the effective date of this Ordinance.

7.3 PENALTIES

Any person who owns, rents, occupies, or maintains any building or premises or uses any land in violation of this Ordinance, for each and every violation hereof shall be imprisoned for a period not exceeding thirty (30) days or be fined in an amount not exceeding one two hundred dollars ($200) or both. Each and every day that a violation continues shall constitute a separate offense punishable by a like penalty.

SECTION VIII
PERMITS

8.1 BUILDING PERMIT REQUIRED

It shall be unlawful to commence the excavation for or the construction of any building or any accessory buildings, or to commence the moving or alteration of any buildings, including accessory buildings, or the change in use of any building until the Zoning Officer has issued a building permit for such work or change.

8.2 ISSUANCE OF A BUILDING PERMIT

In applying to the Zoning Officer for a building permit, the applicant shall submit a dimensioned sketch or a scale plan indicating the shape, size and height and location of all buildings to be erected, altered, or moved and of any building already on the lot. The applicant shall also state the existing and intended use of all such buildings and location of existing or proposed water and sewer facilities. In the case of a change of use, the applicant shall, in writing, state that intended change plus any other information as may be required by the Zoning Officer for determining whether the provisions of this Ordinance are being observed. If the propose excavation, alteration, construction, or change of use, as set forth in the application, are in conformity with the provisions of this Ordinance and other regulations of the County then in force, the Zoning Officer shall issue a building permit for such excavation, construction, alteration, or change of use. If a building permit is refused, the Zoning Officer shall state such refusal in writing, with the cause, and shall immediately thereupon mail notice of such refusal to the applicant at the address indicated upon the application. The Zoning Officer shall grant or deny the permit within a reasonable time from the date the application is submitted.

The issuance of a building permit shall, in no case, be construed as waiving any provisions of this Ordinance. A building permit shall become void six (6) months from the date of issuance unless substantial progress has been made by that date on the project described therein.

8.3 REMEDIES

In case any building or structure is erected, constructed, reconstructed, altered, required, converted, or maintained or any building, structure, or land is used in violation of Chapter 11-2 of the South Dakota Codified Laws, as the same now exists or may hereafter be amended or this Ordinance, the Board of County Commissioners may institute any appropriate action or proceedings to prevent such unlawful erection, construction, reconstruction, alteration, repair, conversion, maintenance or use, to retrain, correct, or abate such violation to prevent the occupancy of said building, structure, or land or to prevent any illegal act, conduct, business or use in or about such premises.

8.4 PERMITS POSTED

Such permits shall be posted in a conspicuous place upon the premises at all times from the beginning until the completion of such construction, alteration, repair, occupancy or change of use.

SECTION IX
BOARD OF ADJUSTMENT

9.1 ESTABLISMENT

The Board of Codington County Commissioners shall appoint the Codington County Planning Commission and two (2) alternates to act as the Board of Adjustment. If a Planning Commissioner acting as a Board of Adjustment member is unable to attend a meeting, the first alternate, or second alternate, in turn, shall serve in the member's place. Alternates may be appointed for a term of three years.

9.2 POWERS AND DUTIES OF THE BOARD

The Board of Adjustment shall have the following powers and duties:

A. Administrative Review

To hear and decide where it is alleged by the appellant that there is error in any order, requirement, permit decision, determination or refusal made by the Zoning Officer or other administrative officers in the carrying out or enforcement of any provision of this Ordinance, and for interpretation of the Zoning Map.

B. Special Exceptions

To hear and decide applications for special exceptions that are specified in this Ordinance and for decisions on any special questions upon which the Board of Adjustment is specifically authorized to pass.

C. Variance

To hear and decide applications for variance from the terms of this Ordinance because of unnecessary hardship and to authorize upon appeal in specific cases such variance from the terms of this Ordinance as which will not be contrary to the public interest where, owing to special conditions, a literal enforcement of the provisions of this Ordinance would result in unnecessary hardship.

Before any variance is granted, all of the following conditions must be shown to be present.

1. Conditions and circumstances are peculiar to the land, structure, or building and do not apply to neighboring lands, structures, or buildings in the same district.

2. Strict application of the provisions of this Ordinance would not deprive the applicant of reasonable use of the land, structure or building equivalent to the use made of neighboring lands, structures or buildings in the same district and permitted under the terms of the Ordinance.

3. The peculiar conditions and circumstances are not the result of actions of the applicant taken subsequent to the adoption of this Ordinance.

4. Financial disadvantage of the property owner shall not constitute conclusive proof of unnecessary hardship within the purposes of zoning.

5. The Board does not possess the powers to permit a use not generally or by special exception, permitted in the district involved.

6. In granting a variance, the Board may attach thereto any conditions and safeguards it deems necessary to desirable in furthering the purposes of this Regulation Ordinance. Violation of any of these conditions or safeguards shall be deemed a violation of this Ordinance.

9.3 PROCEDURES FOR MEETINGS.

The Board of Adjustment shall adopt rules necessary to the conduct of its affairs and in keeping with the provisions of this Ordinance. Meetings shall be held at the call of the chairman and at such other times as the Board of Adjustment may determine. The chairman, or in his absence the acting chairman, may administer oaths and compel the attendance of witnesses. All meetings shall be open to the public.

The Board of Adjustment shall keep minutes of its meetings and proceedings, showing the vote of each member upon each question, or if absent or failing to vote indicating such fact, and shall keep records of its examinations and other official action, all of which shall be filed in the office of the Zoning Officer of Codington County, South Dakota and shall be a public record.

9.4 HEARINGS; APPEALS; NOTICE:

Appeals from the decision of the Zoning Officer concerning interpretation or administration of this Ordinance may be taken by any person aggrieved. The applicant shall file with the Zoning Officer and the Board of Adjustment a notice of appeal specifying the grounds thereof. The Zoning Officer shall forthwith transmit to the Board of Adjustment all papers constituting the record upon which the action appealed from was taken. Such appeal shall be taken within thirty (30) days.

The Board of Adjustment shall hear and decide, on not less than ten (10) days public notice prior to an affixed time and place for hearing appeals where it is alleged by the appellant that there is error in any order, requirement, permit decision, determination or refusal made by the Zoning Officer or other administrative officers in carrying out the enforcement of any provision of this Ordinance, and for interpretation of the Zoning Map. At the hearing, any party may appear in person or by agent or attorney.

9.5 STAY OF PROCEEDINGS

An appeal stays all proceedings in furtherance of the action appealed from unless the Zoning Officer from whom the appeal is taken certifies to the Board of Adjustment after the notice of appeal is filed with him, that by reason of facts stated in the certificate, a stay would, in his opinion, cause an imminent peril to life and property. In such case proceedings shall not be stayed other than by a restraining order which may be granted by the Board of Adjustment or by

a court of record on application, on notice to the Zoning Officer from whom the appeal is taken and on due cause shown.

9.6 PROCEDURES FOR SPECIAL EXCEPTIONS AND VARIANCES

9.6.1 Special Exceptions

The following procedure for requesting a Special Exception Permit shall be followed:

A. The Board of Adjustment shall follow the following procedure in considering the recommendation of the Zoning Officer. A Special Exception Permit from the terms of this ordinance shall not be granted by the Board of Adjustment unless and until:

1. An application for a Special Exception Permit, available from the Zoning Officer, shall be completed by the landowner requesting the Special Exception Permit. Any required attachments and fees as in 6.4 shall further accompany the application. The written application for a special exception shall indicate the section of this Ordinance under which the special exception is sought and stating the grounds on which it is requested; Completed applications shall be returned to the Zoning Officer for review. To be considered by the Board of Adjustment, the application form shall be completed. If any of the information required by Section VIII has changed since the original Building Permit application, the revised, update or corrected information shall accompany the application for a Special Exception Permit.

2. The Zoning Officer shall review the application, and shall make a recommendation to the Board of Adjustment to either approve or not approve said application. The Zoning Officer's recommendation shall include a summary of the application, and reasons and justification for either approval of or disapproval of the application.

3. The Zoning Officer shall set the date, time and place for a public hearing to be held by the Board of Adjustment. The Zoning Officer shall notify the adjacent landowners (excluding public right-of-ways) by mail at the expense of the applicant, at least one week before the public hearing. The Zoning Officer shall publish notice of the public hearing, with all costs to be paid by the applicant, not less than ten (10) days prior to the public hearing in a newspaper of general circulation in the area affected by the proposed Special Exception Permit.

4. A public hearing shall be held. Any party may appear in person, or by agent or attorney;

5. The Board of Adjustment shall rule that it is empowered under the section of this ordinance described in the application to grant the Special Exception, and that the granting of the Special Exception will not adversely affect the public interest; and

6. Before any Special Exception shall be issued, the Board of Adjustment shall make a written finding certifying compliance with the specific rules governing individual Special Exceptions and that satisfactory provision and arrangement has been made concerning the following, where applicable:

   a. Utilities, refuse, and service areas, with reference to locations, availability, and compatibility;

   b. Screening and buffering with reference to type, dimensions, and character;

c. Required yards and other open space; and
d. General compatibility with adjacent properties and other property in the zoning district.

e. Entrance and exit to property and proposed and proposed structures thereon with particular reference to automotive and pedestrian safety and convenience, traffic flow and control, and access in case of fire or catastrophe;

f. Signs, if any, and proposed exterior lighting with reference to glare, traffic safety, economic effect, and compatibility and harmony with properties.

g. Off-street parking and loading areas where required, with particular attention on effects of the special exception on adjoining properties and properties generally within the district.

B. In order to preserve the intent of these zoning regulations and to protect the public interest, the Board of Adjustment may attach conditions to a Special Exception Permit. A Special Exception Permit shall remain valid only as long as the original applicant complies with any terms and conditions of the Special Exception Permit, as attached by the Board of Adjustment.

C. Approval of any application for a Special Exception permit shall be by a two-thirds (2/3) majority (five of seven) of all members of the Board of Adjustment.

9.6.2 Variances.

Variances are designed to allow some flexibility in the zoning regulations, in cases where the exceptional shape of a parcel of land, in cases where use of a property is overwhelmingly effected by exceptional topographic conditions, or any other extraordinary situation or condition of such a parcel of land. Variances are to be approved only when a property owner demonstrates that the provisions of all or part of these zoning regulations present an undue hardship on such property owner's use of such parcel land. A variance shall include a description of the specific regulatory item or items in these zoning regulations, which are found to produce, said undue hardship. Variances shall only be granted when the Board of Adjustments finds that such relief from these zoning regulations will be neither detrimental to the public good nor in conflict with the intent of these zoning regulations.

The following procedure for requesting a Variance shall be followed:

A. The Board of Adjustment shall follow the following procedure in considering the recommendation of the Zoning Officer. A variance from the terms of this ordinance shall not be granted by the Board of Adjustment unless and until:

1. An application for Variance, available from the Zoning Officer, shall be completed by the landowner requesting the variance and shall be accompanied by any required attachments and fees as in 6.4. The written application for a variance shall indicate the section of this Ordinance under which the variance is sought and stating the grounds for which it is requested. Completed applications shall be returned to the Zoning Officer for review. To be considered by the Board of Adjustment, the application form shall be completed. If any of the information required by Section VIII has changed since the original Building Permit application, the revised, updated or corrected information shall

accompany the application for a variance.

2. The Zoning Officer shall review the application, and shall make a recommendation to the Board of Adjustment to either approve or not approve said application. The Zoning Officer's recommendation shall include a summary of the application, and reasons and justification for either approval or disapproval of the application.

3. The Zoning Officer shall set the date, time and place for a public hearing to be held by the Board of Adjustment. The Zoning Officer shall notify the adjacent landowners (excluding public right-of-ways) by mail at the expense of the applicant, at least one week before the public hearing. The Zoning Officer shall publish notice of the public hearing, with all costs to be paid by the applicant, no less than (10) days prior to the public hearing in a newspaper of general circulation in the area affected by the proposed variance.

4. A public hearing shall be held. Any party may appear in person, or by agent or attorney;

5. The Board of Adjustment shall follow the following procedure in considering the recommendation of the Zoning Officer. A variance from the terms of this ordinance shall not be granted by the Board of Adjustments unless and until a written application for a variance is submitted demonstrating:

   a. That special conditions and circumstances exist which are peculiar to the land, structure or building involved, and which are not applicable to other land, structures, or buildings in the same district;

   b. That literal interpretation of the provisions of this ordinance would deprive the applicant of rights commonly enjoyed by other properties in the same district under the terms of this ordinance;

   c. That the special conditions and circumstance do not result from the actions of the applicant;

   d. Financial disadvantage of the property owner shall not constitute conclusive proof of unnecessary hardship within the purposes of zoning.

   e. That granting the variance request will not confer on the applicant any special privilege that is denied by this ordinance to other lands, structures, or buildings in the same district.

   f. No non-conforming use of neighboring lands, structures, or buildings in the same district, and no permitted or non-conforming use of lands, structures, or buildings in other districts shall be considered grounds for the issuance of a variance.

   g. The Board of Adjustment shall make findings that the requirements of 9.6.2 above have been met by the applicant for a variance;

   h. The Board of Adjustment shall further make a finding that the reasons set forth in the application justify the granting of the variance, and that the variance is the minimum variance that will make possible the reasonable use of land, building, or structure; and

i. The Board of Adjustment shall further make a finding that the granting of the variance will be in harmony with the general purpose and intent of this ordinance, and will not be injurious to the neighborhood, or otherwise detrimental to the public welfare.

B. Approval of any variance shall be by a two-thirds (2/3) majority (five of seven votes) of all members of the Board of Adjustment.

C. In granting any variance, the Board of Adjustment may prescribe appropriate conditions and safeguards in conformity with this ordinance. Violations of such conditions and safeguards, when made a part of the terms under which the variance is granted, shall be deemed a violation of this ordinance and punishable under 7.3 of this Ordinance.

Under no circumstances shall the Board of Adjustment grant a variance to allow a use not permissible under the terms of this ordinance in the district involved, or any use expressly or by implication prohibited by the terms of this ordinance in said district.

9.7 Board of Adjustment has Powers of Zoning Officer on Appeals; Reversing Decision of Zoning Officer:

A. It is the intent of this Ordinance that all questions of interpretation and enforcement shall be first presented to the Zoning Officer, and that such questions shall be presented to the Board of Adjustment only on appeal from the decision of the Zoning Officer.

B. In exercising the above-mentioned powers, the Board of Adjustment may, so long as such action is in conformity with the terms of this ordinance, reverse or affirm, wholly or partly, or may modify the order, requirement, decision, or determination appealed from and may make such order, requirement, decision, or determination as ought to be made, and to that end shall have the powers of the Zoning Officer from whom the appeal is taken.

C. The concurring vote of two-thirds (2/3) of all members of the Board of Adjustment shall be necessary to reverse any order, requirement, decision, or determination of the Zoning Officer, or to decide in favor of the applicant on any matter upon which it is required to pass under this ordinance, or to effect any variation in the application of this ordinance.

9.8 Appeals:

Any persons, or any board, taxpayer department, board, or bureau of the County aggrieved by any decision of the Board of Adjustment may seek review by a court of record of such decision, in the manner provided by the laws of the State of South Dakota.

~~SECTION X~~

~~COUNTY PLANNING COMMISSION~~

~~10.1 APPOINTMENT OF COUNTY PLANNING COMMISSION~~

~~The Board of County Commissioners shall appoint a Planning Commission of seven members, at least one member of which shall be a member of the Board of County Commissioners. The Planning Commission shall also be the County Zoning Commission.~~

~~10.2 TERM OF OFFICE~~

~~The term of each of the appointed members of the County Planning Commission shall be for four years. The terms shall be varied so no more than one-third of terms shall expire in the same year. Any appointed member of the county Planning Commission may be removed for cause, after hearing prior to the expiration of the term by a majority vote of the elected members of the Board of County Commissioners. Zoning Officers of the County may be appointed as ex-officio members of the Commission.~~

~~10.3 MEETINGS OF THE PLANNING COMMISSION~~

~~The Planning Commission shall meet at such times as may be necessary to accomplish the purposes of their duties, but in no event shall they meet less than once every three months.~~

~~10.4 PER DIEM AND EXPENSES OF COMMISSION~~

~~Per diem and expenses of the County Planning Commission shall be established by the Board of County Commissioners and paid by the County.~~

EVA's DECOMMISSIONING ESTIMATE FOR PLEASANT RIDGE WIND FARM

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Summary

Energy Ventures Analysis completed an independent analysis of the decommissioning cost for the proposed 250 MW Pleasant Energy Ridge Energy Project in Livingston County. In addition to the EVA factored cost estimate, EVA received an independent bid for completing the project decommissioning from Vissering Construction Company of Streator, Illinois. This project would be comprised of 136 new wind turbines spread throughout a 58,300 acre project site.

The decommissioning project cost is highly sensitive to the defined scope of work for returning the site to its original use. For example, including access road demolition (not included in the landowner easement agreements) could add more than $6 million to the decommissioning cost. The timing of when a wind turbine should be taken down (when it stops operation versus at the end of the project lifetime after all turbines have stopped operating) also can have major implications on cost from difference in mobilization/demobilization efficiencies and economies of scale. In addition, a portion of the demolition costs could be offset from the sale of scrap steel and copper materials that would be created. The scrap values can and will vary significantly by area and are sensitive to changes in the market conditions. For example, if all the turbines were scrapped at once, the large steel scrap volumes created could flood the market and drive down local scrap prices.

As shown in Exhibit 1, EVA estimated that the current net decommissioning costs (after subtracting for scrap value) would cost between $14-32 million dollars. The EVA estimate excludes some cost elements that the Board may want to consider including such as: (a) repair of local roads (Stantec estimate $757,000), (b) electric tie-in and poles (Stantec estimate $199,500), and (c) primary transformer demo (no specs or layout provided). This range is significantly higher than the $5 million net cost estimate provided by Stantec Consulting Services of De Pere, Wisconsin. A full detailed cost estimate is provided in Appendix A and B. The project decommissioning costs will likely continue to increase in the future as labor wages and scrap market conditions change.

Evaluation of Stantec, EVA and Vissering Cost Estimates

Energy Ventures Analysis (EVA) has evaluated the Pleasant Ridge Energy Project Decommissioning Plan (October 8, 2014) located in Livingston County, Illinois. EVA estimates that $14,093,255 ($103,627 per turbine) must be on hand in order to fully decommission the site. EVA concludes that the estimate proposed by Stantec severely understates the total net decommissioning costs and overstates the potential revenues from salvageable materials for the project. Stantec proposes the total net cost to be $5,025,860 ($36,955 per turbine). Vissering Construction Company, provided two independent quotes for the project. The first quote (November 25, 2014) estimates the asynchronous removal of the turbines which posits total net cost of $31,769,946 ($233,432 per turbine). The second assessment (January 5, 2015) assumes all

turbines are removed simultaneously and proposes a total net cost of $25,166,524 ($185,048 per turbine). A summary of the four studies can be found below in Exhibit 1.

Exhibit 1: Net Decommissioning Summary Comparison

Exhibit 1: Net Decommissioning Summary Comparison	Stantec	EVA	Vissering (11/25/14)	Vissering (1/5/15)
Decommissioning Expenses	$ 19,890,500	$ 20,641,655	$ 44,719,870	$ 36,710,282
Potential Revenue - salvage value of turbine components and recoverable materials	$ (14,864,640)	$ (6,548,400)	$ (8,569,500)	$ (8,643,000)
Net Decommissioning Cost	**$ 5,025,860**	**$ 14,093,255**	**$ 36,150,370**	**$ 28,067,282**
Per Turbine Decommission Cost (based on 136 Turbines)	**$ 36,955**	**$ 103,627**	**$ 265,812**	**$ 206,377**

Engineering, planning and permitting: Stantec underestimates the quantity of capital required for general overhead (engineering, planning, contracting, management and permitting) in addition to the assembly and disassembly of crane pads and access roads. Stantec states that $500,000 would be required for overhead and management related fees. EVA has extensive experience estimating the costs of general overhead, management and planning in order to decommission wind projects and estimates that these costs are $1,675,520. Vissering Construction Co posits it would require $6,596,544 for the entire project if the turbines were to be removed individually. Moreover, they assert that it would cost $2,577,867 if taken down simultaneously. A comparison of each studies' assertion can be found below in exhibit 2. It is highly likely that some turbines may fail earlier than the assumed 20 year life cycle and may require sporadic removal. If the turbines are removed intermittently, the costs would increase substantially due to increased permitting, planning and mobilization and demobilization costs.

Exhibit 2: Comparison of Overhead and Management Costs

Exhibit 2: Comparison of Overhead and Management Costs Company	Cost per Unit	Total Cost
Stantec	$ 3,676	$ 500,000
Energy Ventures Analysis	$ 12,320	$ 1,675,520
Vissering Construction Co. (11/25/14)	$ 48,504	$ 6,596,544
Vissering Construction Co. (1/5/15)	$ 18,955	$ 2,577,867

Wind Turbine Demolition: The single largest decommissioning cost is the demolition of the wind turbines and the foundations. These costs are highly sensitive to the sizing requirements for shipping pieces to the scrap yard. The smaller the pieces, the more labor and supplies are required for torching the thick tower pieces. The thickness of the tower materials are also important. The main disparity between Vissering Construction Co and EVA's estimate for total decommissioning expenses is the cost of torching the turbines into smaller pieces. Their local industry experience estimates the dismantling costs to be approximately $14.5 million more expensive. EVA recommends that the Board require a performance bond in order to hedge the risk of potential costs associated with the deconstruction of turbine components into easily transportable pieces.

Crane Pad Removal: To accurately estimate the costs of crane pad mobilization and destruction, design specifications are required. Crane pad design specifications were not provided for this analysis. Without the design specs, there is insufficient information to perform a more precise estimate of the crane pad removal costs. Vissering Construction Company's estimate provides local insight into the construction costs for wind project decommissioning in the state of Illinois. EVA decommissioning cost incorporates the Vissering crane pad removal cost estimate.

Access Roads: Stantec estimates that a lump sum of $850,000 will be sufficient to fully remove all access roads and reclaim land to its preexisting condition. The design specifications and assumptions stated in Decommissioning Plan were used in EVA's bottoms up approach. EVA estimates the costs associated with road excavation and removal to be $6,266,172, over 7 times greater. A more detailed breakdown of the costs and revenues for the decommissioning of this project can be found in the Appendix.

Scrap Value: Stantec severely overstates the current market salvage value of steel ($370/ton) and copper ($5,200/ton). Stantec relies upon generic salvage prices obtained from the United States Geological Survey but does not reflect the local Livingston County market. EVA surveyed local scrap yards, landfills and trucking companies in November of 2014 and collected quotes for the necessary decommissioning services. G&D Salvage of Loda, IL will pay $200/ton for steel and $1000/ton for copper[1]. This difference is the largest factor contributing to the approximate $8 million disparity in decommissioning revenues between Stantec and EVA analyses. Although the values iron, steel, copper, electrical components, dumping and trucking vary over time, this survey provides a snapshot of prices currently facing the industry in Livingston County, Illinois. Moreover, EVA surveyed local gravel, concrete and sand recycling facilities within a 50 mile radius of the site to obtain salvage values for recycled aggregate base and surface course materials. These facilities stated they do not purchase used aggregate base and surface course, but will accept it without a tipping fee. Vissering Construction Co. reiterates this analysis and does not present a salvage value for road components. The salvage estimates can be found in exhibits A1, A2, A3 and A4 found in the Appendix A.

Conclusion: Stantec's analysis contains major flaws in the estimation of decommissioning expenses and revenues. The disparities between Stantec, EVA and Vissering's studies are due to each entities' valuation of certain assumptions which include: scrap value, overhead and management costs, access road and crane pad removals. The variation of these assumptions has a significant impact on the overall financial feasibility of this project in the long run. The volatility of historical scrapping prices create extreme uncertainty regarding the potential

[1] This quote was obtained through G&D Salvage of Loda, IL. It could be the case if all 136 turbines were to be decommissioned over a short time span that it would quickly flood the market and drive down regional scrap prices given its large volume.

revenues obtained. To protect the community, EVA would recommend the Board require Pleasant Ridge Energy and its parent company Invenergy Wind Development North America LLC to provide a performance bond to complete a scope of work as outlined by the Board that it deems as necessary to return the land to its original use and preserve the area's character. This performance bonding approach would take the risk of future market changes and cost increases and assign them to a highly rated bonding company that must also be approved by the Board. If the Board is willing to take this future financial risk itself, it could require financial assurances to the amount of $36 million (the Vissering cost quote). A performance bond that sufficiently covers all the expenses expounded by Vissering Construction Company would ensure that even the highest estimate's costs are met. If a bond is not issued, the potential for an underestimation in the allocation of capital would financially burden the municipalities and tax payers in Livingston County. The unresolved financial exposure suggest that local municipalities should require the issuance of a performance bond with a value between $20 and $30 million to ensure that all costs are properly accounted at the time of decommissioning.

Appendix A

Comparison of Stantec, EVA, Vissering Scrap Value Estimates

Exhibit A1: Stantec Estimate of Metal Scrappage Value

Exhibit A1: Stantec Estimate of Metal Scrapage Value					
Item	Unit	Number	Salvage Price per Unit	Salvage Price per Turbine	Total (based on 136 WTGs)
Wind Turbine Generators					
Turbine tower (Steel)	Tons per turbine	112	$ 370	$ (41,440)	$ (5,635,840)
Nacelle (Steel)	tons per nacelle	60	$ 370	$ (22,200)	$ (3,019,200)
Rotor Hub (Iron/Steel)	tons per hub	18	$ 370	$ (6,660)	$ (905,760)
Anchor bolts (steel)	tons per turbine	2	$ 370	$ (740)	$ (100,640)
Transformer	per turbine	1	$ 2,500	$ (2,500)	$ (340,000)
Copper	tons per turbine	6	$ 5,200	$ (31,200)	$ (4,243,200)
Total Revenue					**$ (14,244,640)**

Exhibit A2: EVA Estimate of Metal Scrappage Value

Exhibit A2: EVA Estimate of Metal Scrapage Value										
Scrapage Amounts	Unit	Number	Iron and Metal 11/18/14 Verbal Quote ($/ton)	Per Turbine Received Scrapage Value	Total Number of Hauls	Truck Delivery Cost	Cost to Disassemble or Torch	Cost to Load at Wind Farm Crew B-12N	Net Scrapping Value
Turbine Metal									
Rotor Hub (Iron/Steel)	Tons per Hub	18	$ 200	$ (3,600)	1.2		1000	$ 1,729	$ (871)
Nacelle (Steel)	Tons per nacelle	60	$ 200	$ (12,000)	4.0		0	$ 5,763	$ (6,238)
Anchor Bolts (Steel)	Tons per turbine	2	$ 200	$ (400)	0.1		0	$ 192	$ (208)
Turbine Tower (Steel)	Tons per turbine	112	$ 200	$ (22,400)	7.5		5000	$ 10,757	$ (6,643)
Copper	Tons per turbine	6		$ (6,000)	0.4		1000	$ 576	$ (4,424)
Transformer	per turbine	1		$ (3,750)	1.0	250.0	0	$ 716	$ (3,034)
Total per Turbine				$ (48,150)	15.0	3750.0	7000	$ 19,732	$ (17,668)
Total for 136 Turbines				**$ (6,548,400)**		**510000.0**	**952000**	**$2,683,539**	**$(2,402,861)**

Exhibit A3: Vissering Summary Estimate of Scrap Value Revenues (11/25/14)

Exhibit A3: Vissering Summary of Estimated Scrap Value Revenues (11/25/14)		
Activity	Salvage value per turbine	Total Salvage value
Tower Blade Scrap Value	$ (1,500)	$ (204,000)
Rotor Hub Scrap Value	$ (5,400)	$ (734,400)
Nacelle Scrap Value	$ (22,500)	$ (3,060,000)
Tower Support Scrap Value	$ (33,600)	$ (4,569,600)
Transformer Scrap	$ (1,500)	$ (204,000)
Total	**$ (64,500)**	**$ (8,772,000)**

Exhibit A4: Vissering Summary of Estimated Scrap Value Revenues (1/5/2015)

Exhibit A4: Vissering Summary of Estimated Scrap Value Revenues (1/5/2015)				
Activity	Salvage value per turbine		Total Salvage Value	
Tower Blade Scrap Value	$	(1,478)	$	(201,000)
Rotor Hub Scrap Value	$	(5,321)	$	(723,600)
Nacelle Scrap Value	$	(22,169)	$	(3,015,000)
Tower Support Scrap Value	$	(33,106)	$	(4,502,400)
Transformer Scrap	$	(1,478)	$	(201,000)
Total	**$**	**(63,551)**	**$**	**(8,643,000)**

Appendix B

EVA Summary of Estimates

Exhibit B1: EVA Summary of Estimated Decommissioning Expenses

EVA: Summary of Estimated Decommissioning Expenses Activity	Cost Per Turbine	Total Cost
Foundation Removal: Demolition, Excavation, Fill, Landscaping (1)	$ 12,584	$ 1,711,377
Crane Pad Removal: Demolition Excavation, Fill, Landscaping (2)	$ 15,818	$ 2,151,248
Cost of Metal Processing (3)	$ 30,482	$ 4,145,539
Cost of Non-Metal Disposal (3)	$ 9,805	$ 1,333,415
Road Removal (1)		$ 6,266,172
Turbine Transformer Removal (2)	$ 24,694	$ 3,358,384
Overhead and Management (including permitting) (3,4)	$ 12,320	$ 1,675,520
Local Public Road Repair		
Total Costs	**$ 105,702**	**$ 20,641,655**

(1) RS Means

(2) Vissering Construction Co

(3) Verbal Quotes 11/2014

Estiamted engineering, planning, contracting and permits

Exhibit B2: EVA Summary of Estimated Scrap Revenues

EVA: Summary of Estimated Decomissioning Revenues Activity	Salvage value per turbine	Total Salvage value
Rotor Hub (Iron/Steel)	$ (3,600)	$ (489,600)
Nacelle (Steel)	$ (12,000)	$ (1,632,000)
Anchor Bolts (Steel)	$ (400)	$ (54,400)
Turbine Tower (Steel)	$ (22,400)	$ (3,046,400)
Transformer	$ (3,750)	$ (510,000)
Copper	$ (6,000)	$ (816,000)
Aggregate course materials	$ -	$ -
Total	**$ (48,150)**	**$ (6,548,400)**

*For Sources see table: EVA Estimate of Scrappage Value

Exhibit B3: EVA Net Decommissioning Summary

EVA: Net Decommissioning Summary	
Decommissioning Expenses	$ 20,641,655
Potential Revenue - salvage value of turbine components and recoverable	$ (6,548,400)
Net Decommissioning Cost	**$ 14,093,255**
Per Turbine Decommission Cost (based on 136 Turbines)	**$ 103,626.87**

Breakdown of Components Expenses and Revenues

Exhibit B4: EVA Estimate for Foundation Removal and Foundation Land Reclamation

EVA: Estimate for Foundation Removal and Foundation Land Reclamation					
Item	Amount	Cost Basis	Cost per Foundation ($/turbine)	Trucking Cost to Landfill	Landfill Dumping Cost
Wind Turbine Foundation					
Foundation Removal (only 54" of ± 30' de	38 cubic yard per turbine	$165/cu yd (Crew B-38) (1)	$ 6,270	$ 1,262	$ 3,406
Excavation for Foundation Removal	14.39 cu yds @ 300 ft Haul	$14.7/cu yd (Crew B-10W) (1)	$ 212	$ -	$ -
Backfill Foundation and Excavation	52.24 cu yds	$1.89/cu yd backfill (Crew B-10B) PLUS $16.95/cu yd sheepfoot compaction (Crew B-10D) $18.84 / cu yd (1)	$ 984	$ -	$ -
Landscraping/Seeding/Cleanup	44.417 sq yd	$6.40/sq yd Topsoil Placement (Crew B-10S) PLUS $3.74/sq yd Beeching (Crew B-14) $10.14/sq yd (1)	$ 450	$ -	$ -
Subtotal per Turbine			$ 7,916	$ 1,262	$ 3,406
136 Turbine Cost			$ 1,076,586	$ 171,565	$ 463,226
Total Cost					$ 1,711,377

(1) RS Means 2014

Exhibit B5: EVA Estimated Cost of Road Removal and Land Reclamation

EVA: Estimated Cost of Road Removal					
Item	Amount	Cost Basis	Total Cost of Road Removal ($)	Trucking Cost to Landfill (2)	Landfill Dumping Cost (2)
Excavation for Road Removal	53,000 cu yds @ 300 ft Haul	$14.7/cu yd (Crew B-10W) (1)	$ 779,100	$ 1,263,500	$ 3,574
Backfill Road and Excavation	53,000 cu yds	$1.89/cu yd backfill (Crew B-10B) PLUS $16.95/cu yd sheepfoot compaction (Crew B-10D) $18.84 / cu yd (1)	$ 998,520	$ -	$ -
Landscraping/Seeding/Cleanup	317,700 sq yd	$6.40/sq yd Topsoil Placement (Crew B-10S) PLUS $3.74/sq yd Beeching (Crew B-14) $10.14/sq yd (1)	$ 3,221,478	$ -	$ -
Cost Breakdown			$ 4,999,098	$ 1,263,500	$ 3,574
Total Cost					$ 6,266,172

(1) RS Means

(2) Verbal Quotes 11/2014

Exhibit B6: EVA Estimate of Metal Scrappage Value

EVA: Estimate of Metal Scrapage Value Scrapage Amounts	Unit	Number	Iron and Metal 11/18/14 Verbal Quote ($/ton) (2)	Per Turbine Received Scrapage Value	Total Number of Hauls	Truck Delivery Cost (2)	Cost to Disassemble or Torch (2)	Cost to Load at Wind Farm Crew B-12N (1)	Net Scrapping Value
Turbine Metal									
Rotor Hub (Iron/Steel)	Tons per Hub	18	$ 200	$ (3,600)	1.2		1000	$ 1,729	$ (871)
Nacelle (Steel)	Tons per nacelle	60	$ 200	$ (12,000)	4.0		0	$ 5,763	$ (6,238)
Anchor Bolts (Steel)	Tons per turbine	2	$ 200	$ (400)	0.1		0	$ 192	$ (208)
Turbine Tower (Steel)	Tons per turbine	112	$ 200	$ (22,400)	7.5		5000	$ 10,757	$ (6,643)
Copper	Tons per turbine	6		$ (6,000)	0.4		1000	$ 576	$ (4,424)
Transformer	per turbine	1		$ (3,750)	1.0	250.0	0	$ 716	$ (3,034)
Total per Turbine				$ (48,150)	15.0	3750.0	7000	$ 19,732	$ (17,668)
Total for 136 Turbines				$ (6,548,400)		510000.0	952000	$ 2,683,539	$ (2,402,861)

(1) RS Means
(2) Verbal Quotes 11/2014

Exhibit B7: EVA Estimate of Non-Metal Material Disposal Cost

EVA: Estimate of Non-Metal Material Disposal Cost Item	Amount	Site Process Cost (1)	# of Trucking Loads	Cost to Load (1)	Cost of trucking (2)	Landfill Dumping Cost (per ton)	Total dumping cost per turbine
Blades (tons)	20	$ 4,725	1.25	$ 132	$250 per haul	$ 45	$ 900
Nacelle Non-Metal (Tons)	12	$ 1,522	1	$ 132	$250 per haul	$ 45	$ 540
Transformer and Transmission Oils (gallons)	290	$700 = 7 Barrels @ $100/barrel	1	$ -	50.0	$ 45	$ 540
Cost Per Turbine		$ 6,948		$ 264	612.5		$ 1,980
Cost for 136 Turbines	136	$ 944,868		$ 35,967	83300.0		$ 269,280
Total Non-Metal Material Disposal Cost	**$ 1,333,415**						

(1) RS Means
(2) Verbal Quote 11/2014

NEWS RELEASE
May 2, 2017

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PSC Approves Rule Changes Related to Wind Projects

BISMARCK, ND – The North Dakota Public Service Commission (PSC) has approved two sets of rule changes that strengthen requirements for future wind projects and ensure they are properly decommissioned at the end of their use. The rule changes focus on two different areas related to wind projects: (1) decommissioning requirements for when a wind farm is retired, and (2) lighting systems.

"A half century ago our ancestors made a commitment to ensure that our coal mines would be reclaimed when the prairie became quiet again," said Commission Chairman Randy Christmann. "These new rules demonstrate a renewed commitment by our generation to ensure that North Dakota's beautiful landscape will be returned to its splendor when these giant wind turbines reach the end of their usefulness."

One set of rule changes deals with decommissioning and was put in place to ensure that wind projects are properly taken down and cleaned up when the facility is no longer being used. As wind generation continues to expand in North Dakota and the projects grow in size and scale, the costs and consequences of failed or improper decommissioning have become a concern for the Commission. The rules strengthen the method of ensuring funds for decommissioning and restoration are available throughout the life of the project; heighten decommissioning requirements for future projects; and allow the Commission to effectively monitor the costs for decommissioning and restoration. The PSC has been responsible for ensuring reclamation for coal mining in the state since 1970 and incorporated that success and experience in these rule changes. The new rules include the following:

- Requires decommissioning plans, including cost estimates, are filed with and approved by the Commission prior to operation of the facility.
- Addresses the time a company is allowed to complete decommissioning and outlines specifics such as how far underground they have to remove foundations and other facilities.
- Requires financial assurance for decommissioning of projects sited after July 1, 2017. A two-phased approach will be used with an initial financial assurance being provided prior to construction and financial assurance sufficient to ensure complete decommissioning to be provided prior to operation.

"These new rules are a major step forward to ensuring that adequate resources are in place to take down and reclaim our land when these massive wind generation facilities reach the end of their useful life," said Commissioner Julie Fedorchak. "We also take a step forward in adopting new lighting technology. We will address the issue of lighting systems for new and existing facilities more deeply in our next rule package which we will initiate this summer."

The other set of rule changes deals with lights on wind towers. Current wind towers are equipped with lighting systems that feature red lights that blink 24/7 and are often unpopular with residents and visitors who want to enjoy the night sky. The new rules add a policy criteria to allow preference to be given to wind energy projects that commit to installing light mitigation technology subject to commercial availability and Federal Aviation Administration approval. The Commission has been requiring projects permitted since June 2016 to use aircraft detection lighting systems. The system has a radar that can detect when an aircraft is in the area and the lights only turn on when they are needed.

"It's important to plan for the future, to ensure the landscape is returned to its preexisting condition once the useful life of a wind energy producing facility has ended," said Commissioner Brian Kroshus. "The new rules provide the necessary financial and decommissioning assurances needed in order to implement timely, effective restoration plans."

The rule changes will now be sent to the Legislature's Administrative Rules Committee for final approval.

The North Dakota Public Service Commission is a constitutionally created state agency with authority to permit, site and regulate certain business activities in the state including electric and gas utilities, telecommunications companies, power plants, electric transmission lines, pipelines, railroads, grain elevators, auctioneers, commercial weighing devices, pipeline safety and coal mine reclamation. For more information, contact the Public Service Commission at (701) 328-2400 or www.psc.nd.gov.

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Technical University of Denmark

Recycling of wind turbines

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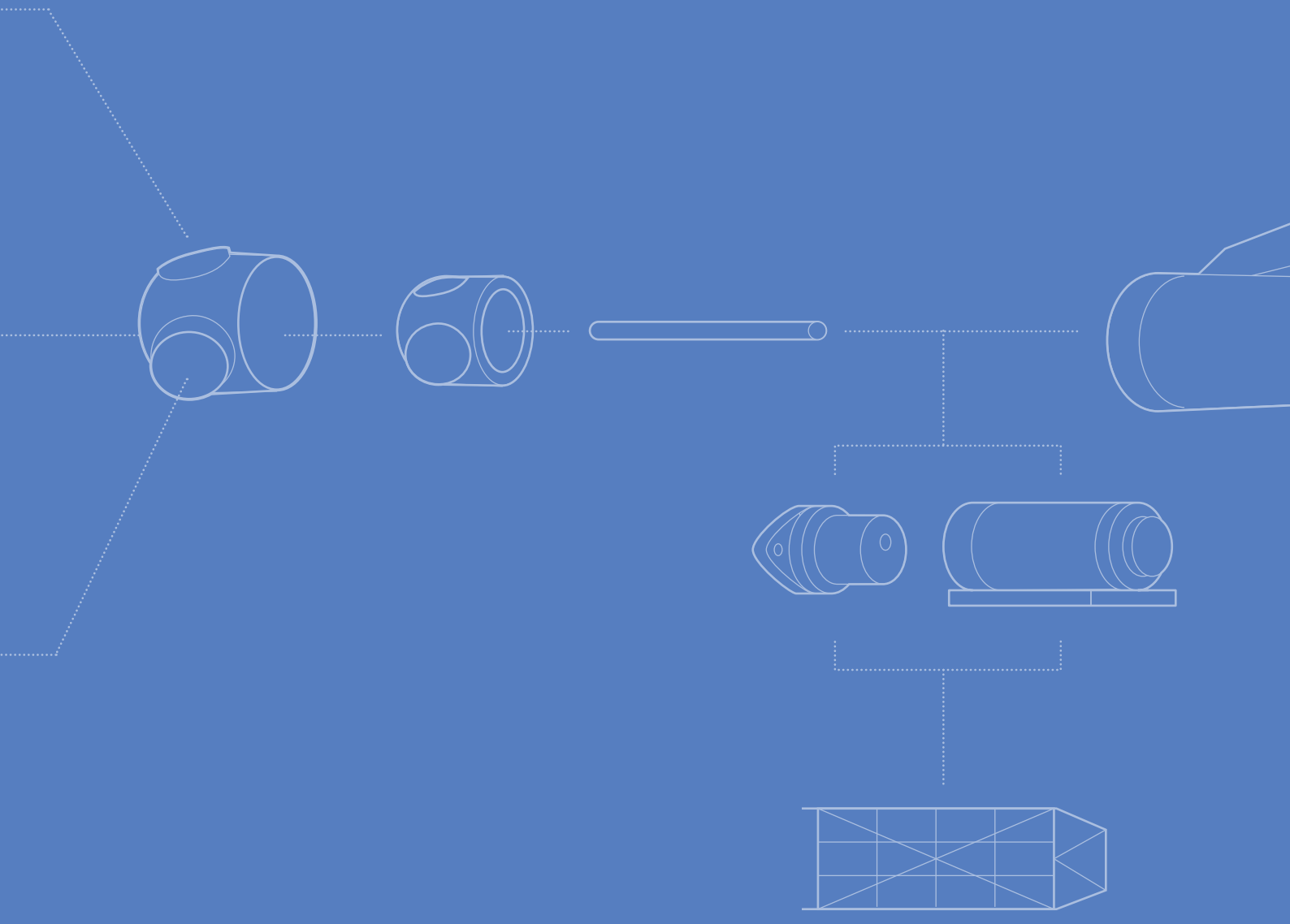
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Chapter 13

Recycling of wind turbines

By **Per Dannemand Andersen** and **Alexandra Bonou**, DTU Management Engineering;
Justine Beauson and **Povl Brøndsted**, DTU Wind Energy



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Wind turbines are one of the most environmentally sound technologies for producing electricity, and wind energy has very low environmental impacts. Within the life cycle of a wind turbine, however, the decommissioning phase has been identified as a blind spot when analysing the environmental impacts of wind power. Most previous impact analyses have focused primarily on the operational phase of the turbine's life cycle, and in some cases also on the manufacturing and installation phases.

Because the wind turbine industry is relatively young, there is only a limited amount of practical experience in the removal and recycling of wind turbines. This is particularly true of offshore wind turbines, which are a fairly recent phenomenon. However, wind turbine recycling is rising up the agendas of policymakers, researchers and industrialists. Several studies of the environmental impact of wind turbines have been carried out recently, along with technology development projects related to turbine recycling, especially for blades. Some manufacturers have also set targets for the recyclability of their wind turbines [1].

Deployment and decommissioning plans

How big is the problem? How many turbines do we need to decommission, and when?

The development phase of a new type of wind turbine might take five years. The planning of a large offshore wind farm might take 5–10 years. Most wind turbines have a design lifetime of 20–25 years. The decisions we take today on the design of wind turbines and wind farms will therefore affect decommissioning and recycling 30–40 years in the future – a rather distant point.

An older study identified a number of factors affecting the future market volume of wind turbines, and consequently the total amount of material used and ultimately to be recycled or disposed of [2]. The same study also identified factors affecting the design of future wind technology, and consequently the types of materials to be used (*Table 8*).

By the end of 2013 wind power had a total global installed capacity of 318 GW, a figure that had risen by approximately 40 GW annually from 2009 to 2013 [3]. Several organisations have developed scenarios for the future growth of the market. These include the International Energy Agency (IEA), which has published two such scenarios [4]. In the "2DS" scenario (an average global temperature rise of 2°C), 1,400 GW of wind power will be installed by 2030 and 2,300 GW by 2050. The more ambitious "hiRen" (high renewables) scenario envisages 1,600 GW of wind power by 2030 and 2,700 GW by 2050. Other organisations have suggested even higher future market volumes. The Global Wind Energy Council, the international trade association for the wind power industry, suggests 2,500 GW of installed wind power by 2030 and 4,800 GW by 2050. These figures do not distinguish between onshore and offshore sites.

By 2013 a typical offshore wind turbine had a capacity of approximately 4 MW and a rotor diameter of 120 m. The sizes of future turbines are more difficult to predict. The study mentioned above extrapolated

Table 8 – Factors determining the future amounts and types of wind turbine materials used and ultimately recycled or disposed [2].

Key factors affecting the future market development of wind turbines – determining the total **amount of material** used and ultimately recycled or disposed of:	Factors affecting the design of future wind technology – determining the **types of material** used and ultimately recycled or disposed of:
• National climate and energy policies • Future power market structures • R&D expenditure (public and industrial)	• New materials (replacement of steel, new composites, superconducting materials, etc.) • Design concepts and main components (power electronics, control strategies, superconducting materials, etc.) • Grid conditions (grid structure, power quality, etc.)

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Table 9 – Masses of the major components of a 2 MW turbine [5].

Component	Mass (tonnes)
Tower	143.0
Nacelle	2.3
Hub	13.3
Blades	19.5
Nose cone	0.3
Transformer/converter	5.0
Generator	6.5
Gearbox	16.0
Bed frame	10.5
Main shaft	5.1

to suggest that the most common turbine size in the period 2020–2030 will be 10 MW [2]. A newer study has based its conclusion on an existing 2 MW turbine [5] (*Table 9*).

The 40 GW of turbines installed annually in the period 2009–2013 will reach the end of their operating lives during 2029–2033. Anticipating the IEA hiRen scenario, it is possible to make a rough estimate of the amount of material that will need to be recycled in the long term (*Table 10*). We assume that ½₀ of the capacity installed by 2030 will need to be decommissioned by 2050; the same estimate for blade material can be found in a recent German study [6].

By comparison, vehicles reaching the end of their lives are estimated to reach a mass of 14 million tonnes per year by 2015 in Europe alone [7].

Future challenges for decommissioning and recycling

Early life-cycle assessment (LCA) studies of offshore wind farms have concluded that environmental impacts come from three main sources [8, 9]:

- bulk waste from the tower and foundations (e.g. from steel production), even though a high percentage of the steel is recycled;
- hazardous waste from components in the nacelle (e.g. from alloy steel);
- greenhouse gases (e.g. CO_2 from steel manufacturing and solvents from surface coatings).

These results indicated that further analysis should take into account changes in the materials used in the tower and the foundations, as well as changes in the design of components in the nacelle (e.g. direct-drive designs and greater use of power electronics).

Cables play an important part in recycling plans for offshore wind farms [8]. Offshore sites require many kilometres of heavy cables of complex/composite construction to resist the harsh environment of the sea. There is a considerable environmental impact from the manufacture of the cables, and since they consist of many different materials, cables are also difficult to dismantle for recycling.

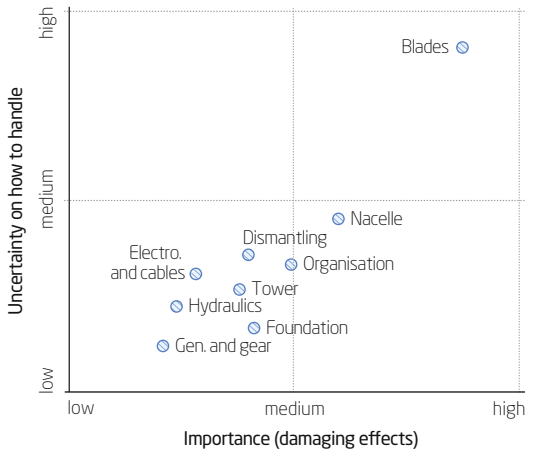
There are some uncertainties and limitations regarding LCA studies of offshore wind turbines. In particular, the specific processes needed for dismantling and recycling, which are crucial to the

Table 10 – Rough global estimates of recycled masses of key wind turbine components in the future.

	40 GW decommissioned annually by 2029–2033	80 GW decommissioned annually by 2050
Steel and cast iron (tower, hub, bed frame, main shaft) – 86t/MW	3,440,000 t	6,880,000 t
Alloys (generator, gearbox) – 11t/MW	440,000 t	880,000 t
Blades – 10t/MW	400,000 t	800,000 t

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Figure 37 - Assessment of the environmental impact and uncertainties.



Assessment of the environmental impact and uncertainties involved in dismantling, recycling and disposing of wind turbines and their components [5]

environmental profile, are not known. Many material recovery processes were not included in these early analyses. Another example of the limitations of many environmental impact studies for wind turbines is that they tend to neglect land use, which is generally considered a critical point elsewhere. Newer LCA studies of wind turbines point to two uncertainties in assessing lifetime environmental impact [10]. The first relates to what will happen to materials and components, in particular the blades, at the end of their lives: will they be recycled, or dumped in landfills? The second area of uncertainty is about decisions taken on servicing and maintenance during the operating life of the turbines. Together, these two uncertainties create an uncertainty of 14–20% in the predicted life-cycle environmental impact of wind turbines [10].

As mentioned above, what happens at the end of a turbine's life has a considerable influence on its overall environmental impact. The options are: second-hand sales of complete turbines; refurbishment to extend the working lives of turbines in their original settings; remanufacturing and re-use of components; recycling; and landfill.

Some studies include only remanufacturing and recycling. Remanufacturing is the process of returning a used component to its original specifications, while recycling recovers the material value without concern for the functional value of the component [5]. However, there exists a second-hand market for used wind turbines. Turbines considered too old or too small for mature markets such as Denmark and Germany can be refurbished and sold in less mature markets such as Eastern Europe and Latin America, giving operators practical experience at low cost [11]. This second-hand market has recently surged.

Another option is to extend the working life of turbines by updating them with newer or refurbished components. Some independent operators, like the DMP Group, specialise in refurbished components for wind turbines. "Repowering" a wind farm usually implies replacing old turbines with newer and larger ones. In that sense it is the site that gets repowered and not the individual turbines.

If old turbines cannot be re-used economically they must be dismantled, their components recycled wherever possible, and the remainder dumped or incinerated. Many components have a commercial value because they contain materials such as steel and copper, and most turbine components are well known to established recycling companies. However, the consequences of recycling increased numbers of generators containing rare-earth magnets are not well studied.

An older study assessed the environmental impact and uncertainties related to decommissioning wind turbines (*Figure 37*) [2]. The study found that blades constitute a major problem, and there is much uncertainty about how to get rid of them properly and safely. The problem lies in the fibreglass composite used for blades. Fibreglass is a low-value material and the dust produced when the blades are cut up creates a hazardous working environment. Empty nacelles are also hard to recycle because they contain many different types of materials, including composites and PVC foam. Electronics and cables are less problematic, since the recycling industry is used to handling these.

A newer study indicates that dismantling and "reverse logistics" might be more costly than the original installation phase [5].

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Based on information from companies the authors of this chapter have assessed the recycling or disposal rate of wind turbines built using current technology (*Table 11*). Electronic components are notable for their low recycling rate, such that up to 50% needs to be treated as waste. Since most LCA and recycling studies of wind turbines focus on the blades, there seems to be a need for better knowledge of how to recycle electronics and other composite components like cables and hydraulic hoses.

Institutional issues

A recent British study of the incentives for recycling composite wind turbine blades in Europe analysed the legislative regime for the recycling of blades, and found it to be quite comprehensive. Blade recycling is subject to EU Directives on issues such as landfill, vehicles (the End of Life Vehicles Directive), waste incineration, waste electrical and electronic equipment (WEEE), and the Waste Framework [7].

Also important may be the EU rules on extended producer responsibility (EPR), which has been applied to a number of sectors such as vehicles and electronic and electrical equipment [7]. Under EPR, manufacturers are responsible for the life cycle impact of their products [12].

This complexity emphasises the importance of knowledge exchange and knowledge development in the interaction between the design, dismantling and recycling phases for wind turbines. Furthermore, the institutional and organisational structure required to dismantle and recycle offshore wind turbines was until recently quite uncertain [2, 5].

Who will actually dismantle and remove the turbines at the end of their lives? Three business models can be identified. In the first, this is the job of established independent operators in the removal and recovery sector. In the second model, which is a variation of the first, specialist independent operators will carry out most of the work, but the blade materials will be recycled by an emerging class of start-up firms set up to take advantage of this opportunity.

The third model involves collaboration and strategic alliances between wind turbine producers (Original Equipment Manufacturers) and the removal and recovery industry. Of the three, this model is the

Table 11 – Recycling rates and disposal routes for wind turbine components.

Material	Recycling/Disposal rate (%)	Disposal method
Ferrous high alloy	98	Recycling
Ferrous metal	95	Recycling
Steel		Recycling
Aluminium and aluminium alloys	95	Recycling
Copper, magnesium, nickel, zinc and their alloys	98	Recycling
Precious metals and other non-ferrous metals and alloys	98	Recycling
Plastics, rubber and other organic materials	100	Incineration with energy recovery
Electronics	50	Recycling with energy recovery
Batteries	100	Recycling
Concrete, bricks etc.	64	Landfill
Sand and gravel	0	Remains in the ground after wind farm is dismantled
Blades	95	Landfill or recycling
Remaining materials		Incineration or landfill

Source: Based on authors' analysis of information from companies.

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best adapted to the expected regulatory changes towards extended product liability and increased producer responsibility. It might also be preferred by the wind turbine manufacturers (OEMs), since it will help them to feed knowledge back into their product development processes and so benefit from designing for recyclability [5].

However, there seems to be a need to further analyse the societal and environmental consequences of these business models and perhaps others. In particular, studies show the need for development policies to encourage recyclability and to stimulate markets for second-hand turbines and independent recycling operators [5].

Recycling fibreglass

As indicated above, it is well known that fibreglass blades can create recycling problems. Several decades of research have now resulted in practical methods for recovering and recycling glass fibre and other materials from composites. [13, 14, 14A] Unfortunately, high investment and processing costs mean that the recovered glass fibres are more expensive than pristine ones, so commercial applications have therefore been limited. The Danish company ReFiber used pyrolysis to recover glass fibres from wind turbine blades for re-use in thermal insulation, but after five years of operation the company ceased trading in 2007 for economic reasons.

The recovery processes are primarily chemical and thermal in nature, with processing temperatures in the range 300–700°C. [15, 16] The most-studied techniques are the fluidised bed, a thermal oxidation process operating at around 450°C; [17] pyrolysis, which decomposes organic molecules into smaller ones in an inert atmosphere at temperature of 300–700°C;[18–21] and supercritical fluids (see below).[22–24]

Heating glass fibres to temperatures above 250°C has been shown to degrade their mechanical properties. [14, 23, 25–28] This limits the use of recovered glass fibres in high-performance composite. One of the challenges is therefore to reduce the operating temperature of the recycling processes. Supercritical fluids are promising in this respect. Many fluids at temperatures and pressures just above their critical points have interesting properties, including high solvent power and liquid-like density combined with gas-like diffusivity and viscosity.

The European project EURECOMP (2009–2012) investigated the use of water to dissolve the matrix material in glass fibre reinforced polyester, but the results were unpromising at temperatures below 300°C. [22–24]

Another project, Genvind (2012–2016), is now running in Denmark with the aim of finding recycling and re-use solutions for wind turbine blade materials. Because the reasons for decommissioning blades are diverse (most often they are still intact), the project is considering several scenarios and process steps, from dismantling to re-use of complete blades. The project's many partners, from both industry and universities, are working to develop suitable technologies and future industrial applications.

Another route might be to produce cement by using decommissioned turbine blades and other waste composites as both a fuel and a raw material. The polymer component of the composite acts as a fuel, while the glass leaves a silica-rich ash that can substitute for some of the sand normally required to make cement. The Lägerdorf cement plant in Germany, operated by Holcim, is already doing this, incorporating up to 50% of fibreglass ash into the clinker. The company claims that the resulting cement is no different from normal in terms of quality and applications. [28]

Perspectives

Based on the above, we can make some recommendations for research, industry and policy.

First, there is a general need for more accurate data to improve LCA calculations relating to wind turbines. This may be especially important for decisions concerned with service and maintenance. These are considered key issues in driving down the cost of electricity produced by wind power, yet they have environmental consequences that may not yet be fully understood. Better data is also needed for the recycling of wind turbine components and materials,

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especially blades. Since materials are responsible for the largest fraction of the total life-cycle emissions from wind turbines, uncertainties in data on recycling have a big influence on the LCA of the turbines as a whole.

Second, design for recyclability is high on the agenda in many industries, including wind power. However, there is a need for better understanding of likely material substitution in future turbine designs. There may also be a need for more knowledge on how to dismantle turbines and break down complex components into recyclable materials.

Third, there is a need to know more about the potential markets for products made from recycled materials. There are established markets for scrap steel and alloys, but there is limited knowledge about the market for secondary products from wind turbine recycling, such as composite matrix materials derived from blades.

Fourth, as wind turbines become more technologically advanced, the use of rare earth materials is increasing, especially in magnets. We need to know more about how to recycle or recover magnets and rare earths.

Fifth, we need policies to stimulate OEMs to design for recyclability, for example through extended producer responsibility within a product service system framework. Valuable experience could be learned from other industries.

Sixth, the current rapid rise in wind power projects in the longer term is creating new business opportunities for second-hand turbines, refurbished components, turbine dismantling services, and recycling of materials. Further into the future, policies to stimulate such markets and entrepreneurial activities might be needed.

As the global installations of wind turbines increase to develop issues related to the decommissioning of wind turbines becomes increasingly higher on the agenda – both in policy making, among researchers and in industry. This chapter has touched upon the most important of aspects related to this issue. However, in a longer perspective much knowledge is still needed.

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Facts about Industrial Wind Turbine Noise

- Wind farm proponents; (wind developers, participating landowners, and government officials); often rely on an industry-backed study to deny health problems. One often cited is the Massachusetts Department of Environmental Planning (DEP) "Wind Turbine Health Impact Study, which has been under a great deal of criticism, with one scientist (Raymond S. Hartman, PhD) saying it "fails to rise to the level of reliable scientific research, is incomplete, biased, distorted, without scientific merit, and not to be used as the basis for public policy." Meanwhile, there are peer-reviewed papers and studies that find links between turbine noise and ill health. Because this is currently not settled, proven science, no one, including governments can claim certainty. Because it is uncertain and involves public health and safety, government must maximize safety measures such as noise limits and setbacks to protect its citizens.

- **The FACTS are**:

    - The closer people are to wind turbines, the greater the negative impacts to them. Close proximity increases exposure to noise pollution, and other risks and annoyances.

    - Not all, but some more sensitive people suffer adverse health effects as a result of living near large wind turbines. This is a result of exposure to the audible and inaudible sound industrial wind turbines produce.

    - Scientific studies show wind turbines disturb sleep, and sleep disturbance is proven to cause impaired health.

    - Peer-reviewed scientific studies have proven the existence of infrasound (McPherson), and how it physically affects people (Salt and Kaltenbach), (Salt and Lichtenhan). "Large wind turbines generate very low frequency sounds and infrasound (below 20 Hz) when the wind driving them is turbulent. The amount of infrasound depends on many factors, including the turbine manufacturer, wind speed, power output, local topography, and the presence of nearby turbines (increasing when the wake from one turbine enters the blades of another). Infrasound cannot be heard and is unrelated to the loudness of the sound that you hear. Infrasound can only be measured with a sound level meter capable of detecting it (and not using the A-weighted scale)." - Alec N. Salt, PhD.

    - It is known that infrasound causes health problems. And it is now being established through sound studies in Brown County, Wisconsin and the Cape Bridgewater Wind Farm in Australia that large wind turbines create infrasound that can be measured in nearby homes. <u>These are facts.</u> The only debate is what safety measures must be taken for mitigating this. LFN and infrasound must be included in zoning regulations.

- **What a Few of the <u>Peer Reviewed</u> Studies are Saying**:

    - **Ambrose - <u>Wind turbine acoustic investigation - Infrasound and low-frequency noise - A case study</u> 2012** An acoustical study was conducted to investigate the presence of infrasonic and low-frequency noise emissions from wind turbines located in Falmouth, Massachusetts, USA. During the study, the investigating acousticians experienced adverse health effects consistent with those reported by some Falmouth residents. The authors conclude that the rapid onset of adverse health effects during the study confirms that wind turbines can harm humans if placed too close to residents.

    - **Hanning - <u>Turbine Noise Seems to Affect Health Adversely 2012</u>** In a survey of people residing in the vicinity of two US wind farms, those living within 375-1400 meters (1,230 – 4,593 feet) reported worse sleep and more daytime sleepiness, in addition to having lower summary scores on the mental component of a health survey than those who lived 3-6.6 km (1.9 – 4.1 miles) from a turbine, with a sharp increase in effects between 1 km and 2 km. A New Zealand

survey showed lower health related quality of life, especially sleep disturbance, in people who lived less than 2 km from turbines. A large body of evidence now exists to suggest that wind turbines disturb sleep and impair health at distances and external noise levels that are permitted in most jurisdictions.

- **Jeffery - Adverse health effects of industrial wind turbines - 2013** Industrial wind turbines can harm human health if sited too close to residents. Harm can be avoided if IWTs are situated at an appropriate distance from humans. Owing to the lack of adequately protective siting guidelines, people exposed to IWTs can be expected to present to their family physicians in increasing numbers. The documented symptoms are usually stress disorder–type diseases acting via indirect pathways and can represent serious harm to human health.

- **Nissenbaum - Effects of industrial wind turbine noise on sleep and health - 2012** We conclude that the noise emissions of IWTs disturbed the sleep and caused daytime sleepiness and impaired mental health in residents living within 1.4 km of the two IWT installations studied. Industrial wind turbine noise is a further source of environmental noise, with the potential to harm human health.

- **Phillips - Properly interpreting the epidemiologic evidence about health effects of industrial wind turbines on nearby residents 2011** There is overwhelming evidence that wind turbines cause serious health problems in nearby residents, usually stress-disorder-type diseases, It is always possible that further research will reveal that, under certain circumstances, turbines can be sited near people's homes with minimal health risk. Such is always possible for any exposure, given the nature of science (open to additional information) and changing technology. But our current knowledge indicates that there are substantial health risks from the existing exposure, and we do not know how to reduce those risks other than by keeping turbines several kilometers away from homes. Dismissal of health effects cannot be seen as honest disagreements about the weight of the evidence.

- **Salt - Infrasound from wind turbines could affect humans 2011** Based on our current knowledge of how the ear works, it is quite possible that low-frequency sounds at the levels generated by wind turbines could affect those living nearby. We can conclude that based on well-documented knowledge of the physiology of the ear and its connections to the brain, it is scientifically possible that infrasound from wind turbines could affect people living nearby.

Don't Ignore New Information

- Knowledge about this is changing fast. A groundbreaking study by sound engineer Stephen Cooper completed at the Cape Bridgewater Wind Farm in Australia proves the connection between large wind turbines and its effects on people. It found a link between an operating wind farm and the sensations of 6 residents in 3 of the nearest homes. The results of this study have prompted a senate inquiry in Australia.

- Cooper's is the first study of effects on people that included a cooperating wind farm operator, in conjunction with a researcher that does not work exclusively for wind farms. Six subjects, 3 couples from different homes, were participants in this study. They were self-selected as being particularly sensitive and susceptible to wind farm acoustic emissions, so much so that one couple has abandoned their house. Cooper found that these six subjects are able to sense attributes of the wind turbine emissions without there being an audible or visual stimulus present, and that these responses correlate with the wind turbine power being generated but not with either the sound or vibration.

- It finds that something is coming from the wind turbines to affect these people and that something increases or decreases as the power output of the turbine increases or decreases. See http://www.pacifichydro.com.au/pacific-hydro-releases-cape-bridgewater-wind-farm-acoustic-study/

- Events in Brown County, Wisconsin support the Cape Bridgewater study. A study was done at the Shirley Wind farm involving four acoustical consulting firms and included Hessler Associates, who derives significant income from wind development projects. The study found "sufficient evidence to classify LFN and infrasound emanating from the turbines as a serious issue, possibly affecting the future of the wind industry". It "showed unequivocally that low level infrasonic sound emissions from the wind turbines were detectable…" The long-term response for inhabitants at one residence studied was severe for the wife and child, causing the family to move, while the husband has experienced no ill effects. This illustrates the complexity of the issue.

- After this independent sound study was done and with careful consideration, the Brown County Board of Health declared industrial wind turbines a human health hazard. See http://bccrwe.com/index.php/8-news/16-duke-energy-s-shirley-wind-declared-human-health-hazard

These studies mean that: (1) wind farm operators cannot say there are no known effects and no known people affected. (2) Local governments charged with protecting the health and welfare of citizens cannot say any longer that they know of no adverse effects.

The Only Proven Safety Measure is a Safe Setback

- Setbacks must be measured from a non-participant's property line. A setback measured from a dwelling limits the non-participating landowner's use of their property, and greatly reduces protections for non-participants from noise pollution and its proven ill effects, shadow flicker, property devaluation, and potential property damage from blade failure or fire.

- All landowners should have the right to do with their land what they choose as long as it doesn't harm or impede a neighboring land owner. A setback for safety reasons, regardless of its distance, must be maintained. Any zoning that allows a wind turbine to be built next to a non-participant's property line eliminates that property owner from safely using that land. It creates an easement over the neighboring, non-participating property that eliminates the owner from any further developments. This amounts to an uncompensated taking of private property rights.

- Because of widespread concerns about health and safety, many jurisdictions scattered around the United States and Canada have adopted larger setbacks in recent years.

Government Entities	
Catarunk, Maine	7,920 ft.
Moscow, Maine	7,920 ft.
Haut-Saint-Laurent, Montérégie, Québéc	6,562 ft.
Fayette County, Pennsylvania	6,000 ft.
Carteret County, North Carolina	5,280 ft. from all abutting property lines
Frankfort, Maine	5,280 ft. from property line
Umatilla County, Oregon	5,280 ft. from "unincorporated community"
Mason County, Kentucky	5,280 ft. from property line
Trempealeau County, Wisconsin	5,280 ft. from inhabited structures
Hillsdale County, Michigan	5,280 ft. from residences
Sumner, Maine	5,280 ft. from property line
Newport, North Carolina	5,000 ft. from neighboring property lines
Ellis County, Kansas	4,921 ft. from rural residences
Rumford, Maine	4,000 ft. from property line
Clifton, Maine	4,000 ft. from occupied structures
San Diego, California	3,937 ft. from residences
Halifax, Nova Scotia	3,281 ft. from habitable building

Claybanks Township, Michigan	3,000 ft. from property line
Cape Vincent, New York	2,953 ft.
Potter County, Pennsylvania	2,900 ft.
Wareham, Massachusetts	2,800 ft. from residences
Goodhue County, Minnesota	2,700 ft. from non-participants
Roanoke County, Virginia	2,640 ft. from residences
Tipton County, Indiana	2,640 ft. from residences
Union Township, Wisconsin	2,640 ft. from residences
Perry, New York	2,640 ft. from residences
Rock County, Wisconsin	2,640 ft.
Buckland, Massachusetts	2,640 ft. from residences
Granville, Pennsylvania	2,500 ft. from property line
Charlton, Massachusetts	2,500 ft.
Allegany, New York	2,500 ft.
Advisory Boards	
UK Noise Association	5,280 ft.
French Academy of Medicine	4,921 ft. from residences
National Research Council	2,640 ft.
Turbine Manufacturers	
Volkswind	1,640 ft. (US) 3,280 (Germany)
Vestas Safety Manual	1,300 ft.

One Mile = 5,280 feet ½ Mile = 2,640 feet ¼ Mile = 1,320 feet
1,000 ft = 305 meters 1,000 meters = 1 km = 3,281 ft = 0.62 mi

RECOMMENDATIONS

Any zoning change that reduces the protections provided under the current Lancaster County limit of 35dBA at night significantly impacts the health of non-participating land owners.

The appropriate setback distance must be measured from the non-participant's property line, not their residence. To ensure citizen health, safety, and property rights, the setback should correspond to a distance of ten rotor heights, or not less than one mile from the non-participant's nearest property line, (unless agreed to).

LFN and infrasound must be included in zoning regulations, and the zoning specify that all post construction sound measurements can be requested by a nonparticipant, and be measured with C-weighted sound measurements to ensure that it is not excessive. The costs of all such testing should be paid by the wind developer, not the county.

The Lancaster County Health Department was provided information from Brown County, Wisconsin regarding wind turbines causing health risks. Based on responses from the Health Department, it appears this information was ignored. Ignoring this information is dangerous for our citizens.

If there is no clear scientific consensus about safety, the county must err to the side of caution and have strict sound limits and significant setbacks.

100% proof of ill effects is not needed

By Merrill Morey, MD, New Castle

I have presented the negative physical effects of industrial wind turbines (IWTs) at multiple meetings in the last year, including a WECS meeting, Planning Commission meetings, County Commissioner meetings, etc. These health problems include headaches, ringing of the ears, sleep disruption, mood disturbances, and an increased incidence of heart attacks in people living in the vicinity of these turbines.

The following link shows that German researchers have proven that the infrasound linked to the turbines can cause a decrease in the force of contraction in heart muscle up to 20 percent. In a person with a healthy heart, this would not normally be a problem, but in someone with heart failure, or a weakened heart from infection or a prior heart attack this could be potentially fatal.

The link is: www.germanenergyblog.de/?p=19852

A few of you have commented that without 100 percent proof that the turbines are harmful you will approve them. I would challenge you to prove the cigarettes 100 percent cause lung cancer. I take care of patients that have smoked multiple packs of cigarettes daily for many years that don't have lung cancer. I also take care of patients who never smoked that get that unfortunate diagnosis. Despite these facts, the government is continually working to decrease the number of people who smoke because of the dangers.

If you read some of the links included in the blog, you will also see that Bavaria successfully defended in their Constitutional Court a 10h minimum setback for wind turbines. This means 10 times the highest point of the turbine. In another link, Saxony has successfully put their setback at 1,000 meters (about 3,281 feet). Since turbine height varies, many feel that any setback should be a multiple of turbine height, rather than a set amount of feet. Some people feel that Europe is ahead of us with renewable energy, and we should learn from their experience. Then should we not also follow their lead in ensuring the safety of the community?

Our elected officials (and by extension their designees on committees) are charged with protecting the community's health and safety. This implies, and I

think demands, that each elected official acknowledges that they have studied both sides of this issue. The community's health is too important to just take a company's word that its products are safe. With community health the goal, the burden of proof related to health effects should be on the officials to uphold the health, safety and welfare of the people.

Thank you very much for your time and consideration.

— *Merrill Morey, MD, New Castle*

Nebraska wind farm projects cause controversy and heartache

Amy G. Hadachek
for The Fence Post
March 16, 2018


Courtesy photo |

A college instructor on the central Plains said farmers and ranchers are always concerned about conservation of natural resources, sustainability, and...


Courtesy photo |

Tax credits are now being phased out on an 80 percent, 60 percent and 40 percent schedule which will end at the end of 2019. In 2020, wind energy will...

TONY BAKER, NEBRASKA SEN. TOM BREWER'S LEGISLATIVE AIDE SAID THAT HE EXPECTS SOME ACTION ON BREWER'S WIND ENERGY BILS BETWEEN NOW AND APRIL 18. "WE CAN EITHER DO A 'PULL MOTION' OR WE CAN TURN THE BILL INTO AN AMENDMENT AND AMEND IT TO PRIORITY BILL THAT IS VOTED OUT OF

COMMITTEE,“ HE SAID. “THOSE ARE THE TWO CHOICES WE HAVE. WHICH ONE WE USE AND WHEN WE CHOSE TO USE IT IS A QUESTION OF TIMING AND ‘FLOOR STRATEGY’ THAT DEPEND ON WHAT AND WHEN THE SPEAKER PUTS CERTAIN BILLS ON THE DAILY AGENDA AND A MYRIAD OF OTHER VARIABLES. THE ‘POLITICS’ BEHIND HOW WE DO ALL THIS IS MESSY, LAST-MINUTE SORT OF BUSINESS.

I CAN PROMISE YOU THAT ONE OF THESE TECHNIQUES WILL BE USED BEFORE THE END OF THE SESSION.”

Passions are high and opinions are as strong as the prevailing wind in northwest Nebraska, as some neighbors and family members on both sides of the wind energy issue in and near Cherry County, Neb., are verbally clashing over financial, emotional and health concerns related to current and proposed future wind farms.

Recently, Nebraska Sen. Tom Brewer, a Republican who represents legislative district 43, introduced two legislative bills supporting neighbors' concerns about the proximity of living near a number of towering turbines that are in full view of others' rural homesteads.

"Sen. Brewer introduced two bills this year, one is LB 1054 that would give people greater opportunity to express their opinions about a proposed wind energy project. Sen. Brewer's second bill this year, LB 752 repeals a law that currently allows privately developed wind energy projects to use eminent domain," said Tony Baker, legislative aide for Brewer's district representing 13 counties in western Nebraska.

"Wind energy is not a good neighbor," Baker said. "It's a constant 55 decibels of noise that rattles pictures on the wall, and then nobody will ever buy my place, and casts shadows, and causes health effects that have come to light like nausea and vertigo. If your neighbor does something on your ground that's not neighborly, you should have a say. The people who are not participating landowners and not compensated should have some aspect of government listening to them."

Nebraska is unique because while most states have a Public Utilities Commission, Nebraska is the only state in the nation served 100 percent by public power utilities. So, it developed a Power Review Board in the 1960s, to regulate the three utilities in Nebraska; Nebraska Public Power District, Lincoln Electric System and Omaha Public Power District.

"Nebraska laws have evolved over the years, to help the Power Review Board accommodate private electrical generation such as wind or solar. That board was designed to regulate public utilities, not private generators of electric utilities, and it often is not a good fit for renewable energy," Baker said. "So, when you're building a public power facility, you need answers, and there's been no place for the people to express their opinion. Sen. Brewer's bill LB 1054 seeks to restore the public's voice in wind energy projects."

WIND TURBINES

And there are robust voices being heard, and overheard on both sides of the issue. With the enticement of expected high-dollar dividends and federal production tax credits, some residents in Cherry County and nearby communities are struggling with daily life challenges, which they attribute to numerous turbines emerging across the landscape. On the map, Cherry County is visibly the largest county in square miles in Nebraska, and with over 166,000 cows, it's known for having more cows than people; making it a desired rural-by-choice location.

Twyla Gallino was born and raised on the same Cherry County ranch where she lives now, between Valentine and Thedford, and is worried about two proposed wind farms.

"We're in the Sand Hills; this area is sand, and I don't think it would hold a turbine. Our aquifer is only about 30 feet down. That concerns me with their large cement pads, and whether chemicals in those pads could possibly leach out into the aquifer, over time," Gallino said. "Bluestem Energy Solutions is proposing a wind farm that would be about 40-miles away. There's another wind farm being discussed that would be just 20 miles south of my home."

Two hours east of Gallino's ranch, farmers Keith and Vickie May of O'Neill, Neb., were told they wouldn't hear anything above 35 to 39 decibels from the Berkshire Hathaway Energy Renewable's (BHE) 400-megawatt, 200-turbine wind farm in northeast Holt County, that went 'online' November 2016. "We live one mile and one-third from the closest wind turbine, and I'm sensitive to low-frequency sounds, so we purchased a decibel meter. Many nights we have a southeast wind, which is the prevailing wind, it sounds like a jet plane revving but the plane never, of course, takes off," Vickie paused, getting emotional and teary, "So, we pay to stay at a hotel in town."

NOT ANTI-WIND

Interestingly, Vickie's husband Keith who's been on their local planning and zoning board voted for the project. "We were not anti-wind," Vickie said. "The night of the vote of the CUP (conditional use permit), my husband acknowledged he had some concerns. They advised us we wouldn't see wind turbines within four to five miles. What we immediately saw was that our view-shed was changed forever, and we were not prepared for the sound issue on our property."

May said she's heartbroken that the constantly blinking turbine tower lights, in full view now, actively compete with Nebraska's starry night sky. She also reported health-related challenges.

"I can feel a rhythmic feeling in my chest," she said "A representative from the company did come out and apologized, commenting he'd never been on the back side of a project, which sounds different from the front side of a wind turbine. We get 'wake turbulation' when the noise picks up from one turbine to the next turbine. We're not anti-renewable energy, we're just for responsible energy. If the developer would've advised my neighbors, and one neighbor could've taken five less turbines, and another neighbor took three less and been less greedy, I wouldn't have had to suffer. We feel we've been misinformed or that something changed. Some pages for vital information were missing before they were granted permits."

SETBACKS AND REGULATIONS

The Fence Post tried to contact Bluestem Energy Solutions/Omaha, Sand Hills Wind, Invenergy, and BHE, which built the energy farm in Holt County, leaving several messages for owners or managers to respond.

"No comment," said BHE spokeswoman Addison Bratvold.

A representative from a different wind energy company suggested noisy turbines might have a defective blade, and that putting blade tips on the turbines could help. "It's important to work with the community," he said, asking that his name not be used.

We did hear back from a manager with Bluestem Sandhills LLC and Cherry County Wind LLC. Cherry County Wind LLC is comprised of 70 families representing 450,000 acres in Cherry County, developing wind energy on private property.

"Cherry County has some of the strictest setbacks and regulations on wind facilities in the country, allowing for reasonable, limited wind development in our county. The sound from a wind facility is limited to 50dBA," said Michael Knapp, chief of operations for Sandhills Energy LLC., on behalf of Bluestem Sandhills LLC and Cherry County Wind LLC. "That is less loud than the traffic on rural Highway 20, which runs through our county, and not remotely loud enough to 'rattle pictures on the wall.' Also, in Cherry County, while a landowner could build a multi-story grain silo or other building within about 120 feet of a neighbor's house, a wind turbine cannot be within a half-mile of any occupied structure. This is a very strict, and very neighborly setback," Knapp said.

Responding to Gallino's concern about potential chemicals, Knapp said, "There are no special chemicals or structures in wind turbine foundations. The Ogallala Aquifer stretches for some 174,000 square miles. The cement used in a wind turbine foundation is just like the cement used for any other building built on land lying over the aquifer. Extensive environmental review and onsite geotechnical engineering ensure that wind turbines are located far from wetlands and waters of the U.S. on ground suitable for stable construction of the tower."

HEALTH CONCERNS

Regarding health concerns, "The Canadian and Australian governments, and many other governments and several U.S. states, have repeatedly done exhaustive reviews of health impacts, and have repeatedly found no issues," Knapp said.

Also in support of wind energy, a college instructor on the central Plains said farmers and ranchers are always concerned about conservation of natural resources, sustainability, and Mother Nature, and that renewable energies like wind energy and solar energy help promote all three.

"Both wind and sunlight are free sources of energy. Neither create air pollution, unlike other types of electrical generation," said Bruce Graham, Wind Energy Technology Department Chair at Cloud County Community College in Concordia, Kan., who's also a rancher. "I visited several wind farms and found the wind itself is generally noisier than the wind turbines. Improvements in wind turbine design with larger rotor diameters, taller towers and more efficient generation has the price of wind energy selling below fossil fuel generation."

Farmer/rancher Kurt Kocher, who has seven wind turbines in the section where he lives in rural Glasco, Kan., in Cloud County, is located one-quarter of a mile from a turbine.

"Once in awhile, when humidity is high, we hear turbines cutting through the air," he said. "We don't have many neighbors, we have a neighbor one mile east of us and they have a turbine about three-eighths of a mile from their home. We're both being paid to have them by EDP Renewables, as a tenant."

A south wind blows at Kocher's farm about 70 percent of the time. "And that south wind would affect the back side of the turbine. However, 90 percent of the time, we never hear it," Kocher said. "That's just my observation, someone else may be different."

Baker, meanwhile, is adamant Nebraska doesn't need wind power. "Nebraska has a surplus of electrical generation because we have a big nuclear plant and large coal producing plants," Baker said. "The only reason for developers to put up turbines is to make money. The company doesn't own the tax credit, but rather they sell it. The wind energy company comes in and signs a multi-year lease, a non-disclosure clause and makes a few thousand dollars per turbine. When you're in an ag economy and the economy is doing terribly, people are interested."

Nebraska is in a 14-state consortium known as the Southwest Power Pool, seeking renewable energy. "In this 14-state consortium, we're doing something in our state, that's not for our state, but rather for the consortium," Baker said.

Graham said electricity generated by wind farms goes directly to the nearest load.

"The electrons producing electricity are used by the nearest farms, households and businesses," Graham said. The electricity from a wind farm can be sold to a company or utility located in a neighboring state. "Local businesses benefit from wind farms, landowners benefit from lease payments, and local young people can stay in the neighborhood and have very good job opportunities," said the college instructor.

"But, if the federal production tax credit were ever to expire, (cost per kilowatt hour) you'd never see another wind farm," Baker said. "You gotta make payroll, pay salaries, which all go into making a kilowatt hour. There's no way to sell energy made with wind except with the federal production tax credit. These things are tax credit generators."

TAX CREDITS

Regarding the tax credit issue, Knapp said, "For a good look at fossil fuel subsidies versus renewable energy subsidies, head to Cherry County Wind Frequently Asked Questions (FAQ) at http://www.cherrycountywind.com/faq/#subsidies.

"Wind industry tax credits have benefited rural America by growing the economy, creating higher paying jobs, saving electricity consumer's money and supporting the U.S. manufacturing industry. Tax credits are now being phased out on an 80 percent, 60 percent and 40 percent schedule which will end at the end of 2019. In 2020, wind energy will have no tax credits available, unlike all other forms of electrical generation. From all the wind turbine component parts (blades, towers nacelles,) traveling on the Kansas highways it doesn't look like wind energy is going away anytime soon," Graham said.

Baker is also concerned about what he calls a conflict of interest.

"All Cherry County board members have documented conflicts of interest. How can the board be objective and represent all the citizens in the county, when they have an interest and a financial stake in the project? Baker said. If someone is an elected county board member, and think they have a conflict of interest, they have to report it and it would be documented. "Nebraska law currently does not prohibit a county official from voting if they have a documented conflict of interest," Baker said. "The senator's point is preferably a local control issue. But when the local board is part of the project, it's a problem. The perfect answer would be: two miles from a transmission line."

The Cherry County Commission chairwoman disagreed with Baker's comments.

"Mr. Baker's statement is blatantly untrue, as not all of the Cherry County Commissioners have a 'documented conflict of interest and a financial stake in the project,'" said Tanya Storer, Cherry County Commission chair. "All three commissioners, myself included, submitted their information to the Nebraska Accountability and Disclosure Office, as required by law. Only one of the three Commissioners, Mr. VanWinkle, was determined to

have a conflict of interest/financial stake. I am in no way invested in, or involved in Cherry County Wind. I have several family members who are, all of which I reported. I, nor my husband, have ever been a member or invested in any wind project, including Cherry County Wind. All of this information is publicly available through the Accountability and Disclosure Office (http://www.nadc.nebraska.gov).

Storer agreed that the issue has been very controversial in Cherry County, noting, after months of public comment and two public hearings, the first permit for a wind farm was denied in December 2016 due to noncompliance with planning and zoning regulations.

"Due to concerns from Cherry County citzens, the commissioners asked our Planning and Zoning Board to research three specific issues and report back to the commissioners: input from local fire chiefs about fire management related to wind towers; commission an independent appraiser regarding any impact on land valuations on agricultural/grazing; review a recent study completed by the Lancaster Department of Health regarding potential health risks/impacts from wind turbines," Storer said. The completed report can be viewed at: http://www.co.cherry.ne.us/webpages/planning_zoning/planning_zoning.html.

INCREASE SETBACKS

Storer also recommended that planning and zoning increase setbacks (the distance an approved development has to be from a non-participating house, public use area, school, road, etc.) for wind generation facilities, from one-half mile to two miles, which is similar to feedlots. "I don't think the wind industry should be treated more favorably than our own agriculture industry, and I recommended setbacks be structured similarly to our ag industry setbacks," Storer said.

Baker said wind energy is pitting family and friends against each other in northwest Nebraska.

"In the Sandhills of Nebraska, they're the greatest people and would do anything to help you," he said. "But, family members and friends in Cherry County are fighting with each other, because they're in conflict over wind energy projects and making money from it. Wind energy is tearing apart the fabric of Nebraska's rural communities, as it has done in other regional states."

"I have no personal vendetta against them, I'm just merely stating how it's affected us," Vickie May said. "Others may not be as sensitive, but we all feel things differently. Get strong planning and zoning for it."

Baker said people need to remember the importance of being good neighbors, "If you want a check, just don't screw over your neighbors in the process," he said. "This is about giving

people a voice, who are affected by industrial wind energy projects, and making sure neighbors have a voice."

— Hadachek is a freelance writer who lives on a farm with her husband in north central Kansas and is also a meteorologist and storm chaser. She can be reached at: rotatingstorm2004@yahoo.com.

Liability

https://www.airplanecrash-lawyer.com/blog/2017/02/widow-sues-faa-for-wind-turbine-airplane-crash.shtml

Widow Sues FAA for Wind Turbine Airplane Crash

By Ilyas Akbari of Baum, Hedlund, Aristei & Goldman, P.C. posted in Plane Crash on Thursday, February 16, 2017.

A woman whose husband was killed in a 2014 small private airplane crash in South Dakota has now brought a federal lawsuit against the Federal Aviation Administration (FAA), claiming they are to blame for her husband's death.

Natalie Rau, whose husband, Logan Rau, died in the crash, says she believes the administration did not take adequate measures to prevent the crash. Her charges against the FAA center on the wind farm where the airplane crash took place, and allegations that the FAA did not include the wind farm on their aeronautical charts, nor did they ensure the turbines were properly lighted to prevent a crash.

Four Killed in South Dakota Plane Crash

The piper plane crash in question occurred on April 27, 2014 . The four men on board were returning to Gettysburg, South Dakota from a cattle sale in Hereford, Texas. On the trip down to Texas, the men had encountered wind and fog, to the point that they mentioned the weather conditions to colleagues at the cattle sale. On the trip home, they faced more of the same travel conditions.

Piloting the Piper airplane was 30-year-old Donald J. "D.J." Fischer, who lived in Gettysburg, worked as a crop sprayer for Air Kraft Spraying, Inc., and was a fixture of the community. His passengers were Logan Rau, Brent Beitelspacher, and Nick Reimann-all cattlemen. As Fischer fueled up the Piper airplane before the trip back to South Dakota, he commented to a fixed base operator employee at Hereford Airport that the only reason they were leaving then was because one of the passengers was anxious to get home.

Initially, the trip progressed as planned, with Fischer checking in on weather conditions and updating on the plane's position. It wasn't until the plane did not arrive in Gettysburg that a family member raised concern and reported the plane missing. It would not be until 3:30 a.m. on April 28, 2014, that the Hyde County Fire Department and the Hyde County sheriff's department

would discover the wreckage at South Dakota Wind Energy Center, not far from Highmore airport. All four men had perished in the crash.

What's Known About the Piper Crash?

Officials faced several challenges in discerning the details of the South Dakota plane crash.

For one thing, Fischer was not in communication with air traffic control when the crash occurred, nor was there radar data for the plane at the time of the accident. The flight recorder on board, which could store historical position information, was also destroyed in the crash.

Still, officials were able to come up with some facts:

· The plane crash had taken place at about 10:16 p.m. in winds of around 21 miles per hour. The plane broke apart on impact and was scattered around the field below the one of the wind turbines.

· Fischer was current on all his requirements as a pilot and had logged nearly 4,000 hours of flight time between April of 2010 and April of 2014. Furthermore, he was familiar with the area where the crash occurred.

· The Piper airplane, a PA-32R-300, was maintained under an annual inspection program and had last been inspected on April 17, 2013.

A bigger variable for officials to address was the wind farm.

Was the Wind Farm the Cause?

Fischer knew about the presence of South Dakota Wind Energy Center, which is owned by NextEra Energy Resources. In fact, he knew enough about the wind farm to voice concern over it to the FAA Flight Standards District Office in Rapid City (though further details about what he said are unavailable).

The location of the airplane crash, and the damage to wind turbine tower #14 (one of 27 on the wind farm) suggest that a collision was the cause of the crash. A more looming question is why, if Fischer knew the wind farm was there, did the collision happen?

The official report from the National Transportation Safety Board (NTSB) on the airplane crashhighlights a couple of factors that may have been responsible.

First, the obstruction light on the tower did not work properly when it was tested after the accident. A witness (who did not see the crash) claimed that the light on that tower was not working at the time of plane crash, and had not been for an unidentified amount of time. Later, however, the witness would not return calls to verify their claims.

Secondly, the NTSB found that the South Dakota Energy Center wind farm was not depicted as such on the charts Fischer was using. The wind farm would not be depicted until the next edition of the chart, which became effective on July 24, 2014.

Those are also the reasons why Natalie Rau believes the FAA is responsible for the death of her husband, who never returned home from his trip to Texas.

KSFY News@ksfynews

The widow of a South Dakota man who was killed in a plane crash in 2014 is blaming the FAA for the accident http://www.ksfy.com/content/news/Federal-lawsuit-faults-FAA-for-2014-South-Dakota-plane-crash-413321883.html … #KSFY
2:53 PM - Feb 9, 2017



Federal lawsuit faults FAA for 2014 South Dakota plane crash

The widow of a South Dakota man who was killed in a plane crash in 2014 is blaming the Federal Aviation Administration for the accident.
ksfy.com

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See KSFY News's other Tweets

Twitter Ads info and privacy

$6.7 Million Awarded in Previous Wrongful Death Verdict Against Wind Farm

Pilots have long had concerns about the safety of wind farms, and some of those fears were validated in 2011 when Steve Allen, a Northern California agricultural pilot with over 25,000 accident-free flight hours, crashed into a nearly invisible wind observation tower and was killed.

The tower had been set up to see if the location was good for a wind farm, and had been built to be mere inches under 200 feet, because any tower under 200 feet did not have to be lighted or reported to the FAA. While skirting these regulations sped things up for wind energy companies, it created an incredible risk for pilots, who were highly unlikely to know about or see the towers.

Allen's family was awarded $6.7 million in the wrongful death settlement they filed.

Wind Farm Airplane Crash in Germany Reignites Concerns

As Rau takes her case to court, another wind farm airplane crash has occurred, this one in Northwestern Germany.

The cause of that crash has not been determined, but officials have said the pilot collided with a wind turbine while flying at a height of 40 meters and in relatively clear weather conditions.

Fears from the crash in Germany have been strong enough to cast doubts on a new wind farm project in Swansea, a county in Wales.

30 Negatives of WIND energy (Many of which don't need peer-reviewed study.)

1. Audible sound
2 . Inaudible sound and vibration/pulsation
3. Accompanying sleep deprivation that
4. Can cause negative health issues.
5. Higher electricity rates
6. MASSIVE gov't handouts Oil, nuclear, and natural gas don't receive any where near that amount.
7. Shadow flicker
8. Barely 35% efficient. Need back up fossil fuel plants that run constantly creating nothing but pollution.
9. Trespass Zoning (uncompensated easement without permission)
10. Miles and miles and miles of additional transmission lines above and below ground.
11. Red flashing warning lights
12. Weak or NO decommissioning language in wind ordinances that can result in eye sores for generations.
13. Oil leaks from wind turbine
14. Ice throw
15. Blade throw
16. Fire in the Nacelle
17. Wind turbine collapse
18. Stray/Induced Voltage
19. Possible damage to water in water wells depending on layout and location of wind turbine.
20. Aesthetics
21. Damage to wildlife, domestic and farm animals
22. Bird and BAT kills
23. Loss of property value
24. Reduction in economic growth and expansion
25. interference with emergency radio broadcasts
26. interferes with crop dusting
27. Mercy flight interference
28. Damaging to economy of tourist areas
29. Destruction of the social fabric in smaller communities
30. Toxic/radioactive pollution from mining rare earth metals used in wind turbine magnets.

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NOTICE OF SUBCONTRACTORS CLAIM and ILLINOIS MECHANIC'S LIEN CLAIM-LEASEHOLD IMPROVEMENT
(770 ILCS 60/7)

STATE OF ILLINOIS
COUNTY OF **VERMILION**

The claimant, **Ambassador Steel Fabrication, LLC, P. O. Box 627, Auburn, IN 46706,** hereby files a claim for lien against **IKEA Energy US, LLC, 420 Alan Wood Road, Conshohocken, PA 19428, Lessee/Lender, Hoopeston Wind LLC, Court Square Bldg, 301 4th St NE Ste 900, Charlottesville, VA 22902, Lessee/Contracting Entity, Apex Clean Energy, 310 4th Street NE Ste 200, Charlottesville, VA 22902, Lessee Agent, and Michels Corp., 817 West Main Street, Brownsville, WI 53006, Contractor,** and ALL UNKNOWN OWNERS AND NONRECORD CLAIMANTS and states:

That on **June 17, 2014,** the Lessee owned the following described leasehold in the County of **Vermilion,** State of Illinois, to wit:

See attached Legal Description of Land, identified all lessors and lessees in Vermilion County, State of Illinois

Commonly known as: **Hoopeston Wind Farm, Rossville, IL 60693, Vermilion County**

That on **June 17, 2014,** claimant made a contract with said contractor to furnish **and install reinforcing steel,** for the sum of **$2,028,669.68** and to date the materials and labor for the amount of **$2,028,669.68** have been provided to the value of **$2,028,669.68.** The last date on which materials were delivered or labor was performed was **October 3, 2014.**

That said owner is entitled to credits on account as follows: **$593,267.25**

leaving due, unpaid and owing to client, after allowing all credits, the balance of **$1,435,402.43** for which, with interest, claimant claims a lien on said land and improvements.

Ambassador Steel Fabrication, LLC

BY:_____
Allan R. Popper of Lienguard, Inc.
Agent for Ambassador Steel Fabrication, LLC
P. O. Box 627
Auburn, IN 46708

File No.: 100296-14-1

STATE OF ILLINOIS)
COUNTY OF DUPAGE) SS

Affiant, Allan R. Popper, being first duly sworn, on oath deposes and says that he is the agent of the claimant; that he has read the foregoing notice and claim for lien and knows the contents thereof; and that all statements therein contained are true.

Allan R. Popper of Lienguard, Inc., Agent for
Ambassador Steel Fabrication, LLC
P. O. Box 627
Auburn, IN 46708

Subscribed and sworn to on **December 17, 2014**

Florence N. Santarsieri Notary Public

OFFICIAL SEAL
FLORENCE N. SANTARSIERI
NOTARY PUBLIC, STATE OF ILLINOIS
My Commission Expires 10/18/2018

Prepared by and return
Recorded document to:
Allan R. Popper
Lienguard, Inc.
1000 Jorie Blvd. Ste. 270
Oak Brook IL 60523

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SCHEDULE A TO
SECOND AMENDMENT TO
CONSTRUCTION MORTGAGE ET AL.

Legal Description of Land

Lease 001
IL-HOO-001
Michael A. von Neumann, Frederic R. von Neumann, Erik R. von Neumann and Heirs of Frances Wyers

THE EAST HALF OF THE SOUTHEAST QUARTER OF SECTION 35, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 02-35-400-002

Lease 002
IL-HOO-002
William A. Marshall, Jr., Life Estate
the Heirs of Marcia Hill, Remaindermen
Subject to the interests of Amy Reetz arising out of a Contract for Deed

THE SOUTHWEST QUARTER OF SECTION 26, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT 2 PARCELS OF LAND CONVEYED TO THE STATE OF ILLINOIS IN WARRANTY DEED, RECORDED AS DOCUMENT NO. 90-1721, AND MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTHWEST CORNER OF THE SOUTHWEST QUARTER OF SAID SECTION 26, THENCE NORTH 88 DEGREES 36 MINUTES 21 SECONDS EAST FOR 31.12 FEET ALONG THE SOUTH LINE OF SAID SECTION 26, THENCE NORTH 1 DEGREE 37 MINUTES 48 SECONDS WEST FOR 18.08 FEET TO THE PLACE OF BEGINNING, FROM THE PLACE OF BEGINNING THENCE NORTH 1 DEGREE 52 MINUTES 53 SECONDS WEST FOR 22.50 FEET ALONG THE EXISTING EAST RIGHT OF WAY LINE OF FAS ROUTE 331, THENCE SOUTH 46 DEGREES 53 MINUTES 28 SECONDS EAST FOR 32.10 FEET, THENCE SOUTH 88 DEGREES 36 MINUTES 21 SECONDS WEST FOR 22.70 FEET ALONG THE NORTH RIGHT OF WAY LINE OF TR 31 TO THE PLACE OF BEGINNING, CONTAINING 0.006 OF AN ACRE, MORE OR LESS

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ALSO SAVE AND EXCEPT

COMMENCING AT THE NORTHWEST CORNER OF THE SOUTHWEST QUARTER OF SAID SECTION 26, THENCE SOUTH 1 DEGREE 37 MINUTES 48 SECONDS EAST FOR 1,576.63 FEET ALONG THE CENTERLINE OF FAS ROUTE 331, THENCE NORTH 88 DEGREES 22 MINUTES 13 SECONDS EAST FOR 30.00 FEET TO THE PLACE OF BEGINNING, FROM THE PLACE OF BEGINNING THENCE SOUTH 15 DEGREES 29 MINUTES 58 SECONDS EAST FOR 83.43 FEET, THENCE SOUTH 12 DEGREES 34 MINUTES 37 SECONDS WEST FOR 81.49 FEET, THENCE NORTH 1 DEGREE 37 MINUTES 48 SECONDS WEST FOR 160.00 FEET ALONG A LINE LYING 30 FEET EAST OF AND PARALLEL WITH THE CENTERLINE OF FAS ROUTE 331 TO THE PLACE OF BEGINNING, CONTAINING 0.037 OF AN ACRE, MORE OR LESS

CONTAINING 0.043 OF AN ACRE, MORE OR LESS

ALSO SAVE AND EXCEPT A PARCEL OF LAND DESCRIBED AS FOLLOWS:

BEGINNING ON THE WEST LINE OF THE SOUTHWEST QUARTER OF SECTION 26, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, 819 FEET SOUTH OF THE NORTHWEST QUARTER OF SAID SOUTHWEST QUARTER RUNNING THENCE SOUTH 354 FEET ON SAID WEST LINE, THENCE 90 DEGREES TO THE LEFT 313 FEET, THENCE NORTH 354 FEET PARALLEL WITH SAID WEST LINE, AND THENCE WESTERLY 313 FEET TO THE PLACE OF BEGINNING, ENCOMPASSING APPROXIMATELY 2.544 ACRES

PIN 02-26-300-001

Lease 003
IL-HOO-003
Dewain J. Moore, Trustee of the Harold and Ardith A Orr Trust

THE WEST HALF OF THE NORTHEAST QUARTER OF SECTION 11, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 07-11-200-001

Lease 004
IL-HOO-004
MWG Holdings, LLC, an Illinois limited liability company

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LOT 1 OF THE NORTHWEST QUARTER OF SECTION 5, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT:

A PARCEL OF LAND SITUATED IN THE SOUTHWEST CORNER OF THE NORTHWEST QUARTER OF SAID SECTION 5, DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF THE NORTHWEST QUARTER OF SAID SECTION; THENCE NORTH ALONG THE CENTER LINE OF PUBLIC ROAD 355 FEET; THENCE EAST 202 FEET; THENCE SOUTH TO THE SOUTH LINE OF SAID NORTHWEST QUARTER 355 FEET; THENCE WEST 202 FEET TO THE PLACE OF BEGINNING, VERMILION COUNTY, ILLINOIS

PIN 08-05-100-003

Lease 005
IL-HOO-005
Bruce E. Frank and Bonita J. Frank, joint tenants

PARCEL 1

THE NORTH HALF OF THE SOUTH HALF OF THE NORTHEAST QUARTER OF SECTION 1, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 07-01-200-005

PARCEL 2

THE SOUTH HALF OF THE SOUTH HALF OF THE NORTHEAST QUARTER OF SECTION 1, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 07-01-200-006

Lease 006
IL-HOO-006
Bush LLC (Parcels 1-5)
Hoopeston Wind, LLC (Parcel 6)

PARCEL 1

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THE SOUTHEAST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 33, TOWNSHIP 23 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 03-33-300-003

PARCEL 2

THE SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 33, TOWNSHIP 23 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 03-33-400-003

PARCEL 3

THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 33, TOWNSHIP 23 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT

THE NORTH 20 ACRES OF THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 33, TOWNSHIP 23 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 03-33-400-001

PARCEL 4

THE NORTHWEST QUARTER OF SECTION 3, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT

SAVE AND EXCEPT 2 PARCELS OF LAND CONVEYED TO HOOPESTON WIND, LLC, IN WARRANTY DEED, DATED MAY 9, 2014, RECORDED MAY 20, 2014, AS DOCUMENT NO. 14-03553, OFFICIAL PUBLIC RECORDS, VERMILION COUNTY, ILLINOIS, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

SWITCHYARD PARCEL

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A PART OF THE NORTHWEST QUARTER, TOGETHER WITH A PART OF THE NORTHEAST QUARTER OF SECTION 3, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, MORE PARTICULARLY DESCRIBED AS FOLLOWS: BEGINNING AT THE SOUTHEAST CORNER OF SAID NORTHWEST QUARTER OF SECTION 3 AND RUNNING; THENCE NORTH 02°39'14" WEST, ALONG THE EAST LINE OF SAID NORTHWEST QUARTER BEING ALSO THE WEST LINE OF SAID NORTHEAST QUARTER, 276.85 FEET; THENCE NORTH 89°16'45" EAST, 45.02 FEET; THENCE NORTH 02°39'14" WEST, PARALLEL WITH SAID WEST LINE OF THE NORTHEAST QUARTER, 867.52 FEET; THENCE NORTH 89°03'47" EAST, 30.01 FEET; THENCE NORTH 02°39'14" WEST, PARALLEL WITH SAID WEST LINE OF THE NORTHEAST QUARTER, 75.03 FEET, TO THE NORTH LINE OF THE SOUTH HALF OF SAID NORTHEAST QUARTER OF SECTION 3; THENCE SOUTH 89°03'47" WEST, ALONG SAID NORTH LINE, 45.02 FEET; THENCE SOUTH 02°39'14" EAST, PARALLEL WITH SAID WEST LINE OF THE NORTHEAST QUARTER, 752.39 FEET; THENCE SOUTH 89°16'45" WEST, PARALLEL WITH THE SOUTH LINE OF SAID NORTHEAST QUARTER, BEING ALSO COMMON WITH THE SOUTH LINE OF SAID NORTHWEST QUARTER, 496.96 FEET; THENCE SOUTH 02°39'14" EAST, PARALLEL WITH SAID EAST LINE OF THE NORTHWEST QUARTER, 466.96 FEET, TO A POINT ON SAID SOUTH LINE OF THE NORTHWEST QUARTER; AND THENCE NORTH 89°16'45" EAST, ALONG SAID SOUTH LINE, 466.96 FEET, TO THE POINT OF BEGINNING

CONTAINING 240015.69 SQUARE FEET OR 5.51 ACRES OF LAND MORE OR LESS

SUBSTATION PARCEL

A PART OF THE NORTHWEST QUARTER, TOGETHER WITH A PART OF THE NORTHEAST QUARTER OF SECTION 3, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, MORE PARTICULARLY DESCRIBED AS FOLLOWS: COMMENCING AT THE SOUTHEAST CORNER OF SAID NORTHWEST QUARTER OF SECTION 3 AND RUNNING; THENCE NORTH 02°39'14" WEST, ALONG THE EAST LINE OF SAID NORTHWEST QUARTER BEING ALSO THE WEST LINE OF SAID NORTHEAST QUARTER, 466.96 FEET, TO THE POINT OF BEGINNING; THENCE SOUTH 89°16'45" WEST, PARALLEL WITH THE SOUTH LINE OF SAID NORTHWEST QUARTER, 466.96 FEET; THENCE NORTH 02°39'14" WEST, PARALLEL WITH THE EAST LINE OF SAID NORTHWEST QUARTER, 419.19 FEET; THENCE NORTH 89°14'49" EAST, PARALLEL WITH SAID SOUTH LINE OF THE NORTHWEST QUARTER, 466.96 FEET, TO A POINT ON SAID EAST LINE OF THE NORTHWEST QUARTER; THENCE NORTH 02°39'14" WEST, ALONG SAID EAST LINE, 332.81 FEET, TO THE NORTHWEST CORNER OF THE SOUTH HALF OF SAID NORTHEAST QUARTER OF SECTION 3; THENCE NORTH 89°03'47" EAST, ALONG THE NORTH LINE OF SAID SOUTH HALF, 30.01 FEET; THENCE SOUTH 02°39'14 WEST, PARALLEL WITH THE WEST LINE OF SAID NORTHEAST QUARTER, 752.39 FEET; AND THENCE SOUTH 89°16'45" WEST, 30.01 FEET, TO THE POINT OF BEGINNING

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CONTAINING 218265.11 SQUARE FEET OR 5.01 ACRES OF LAND MORE OR LESS

PIN 08-03-100-001

PARCEL 5

THE SOUTH HALF OF THE NORTHEAST QUARTER OF SECTION 3, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS,

SAVE AND EXCEPT THE FOLLOWING FROM THE SOUTH HALF OF THE NORTHEAST QUARTER AND THE SOUTHEAST QUARTER OF SECTION 3:

A PARCEL OF LAND SITUATED IN THE SOUTHEAST QUARTER OF SAID SECTION 3, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, BEING FURTHER DESCRIBED AS FOLLOWS:

BEGINNING AT AN IRON ROAD (sic) SITUATED IN THE SOUTHWEST CORNER OF LOT 8 IN BRAMBLE BUSH ESTATES AS SHOWN IN DEED RECORD VOLUME 825, PAGE 560, DOCUMENT NO. 842901 IN THE OFFICE OF THE COUNTY RECORDER, VERMILION COUNTY, ILLINOIS; THENCE EASTERLY ALONG THE SOUTH LINE OF SAID LOT EXTENDED (SAID LINE BEING THE NORTH LINE OF SAID QUARTER SECTION) A DISTANCE OF 288 FEET TO AN IRON ROD; THENCE SOUTHERLY 181 DEGREES 19 MINUTES 00 SECONDS A DISTANCE OF 150 FEET TO AN IRON ROD; THENCE WESTERLY 269 DEGREES 40 MINUTES 57 SECONDS AND PARALLEL WITH THE NORTH LINE OF SAID QUARTER SECTION A DISTANCE OF 288 FEET TO AN IRON ROD; THENCE NORTHERLY 01 DEGREES 19 MINUTES 00 SECONDS A DISTANCE OF 150 FEET TO THE PLACE OF BEGINNING. AN EASEMENT FOR THE PURPOSE OF INGRESS, EGRESS AND UTILITIES ACROSS A STRIP OF LAND 52 FEET IN EVEN WIDTH LYING WEST OF, ADJACENT AND PARALLEL WITH THE WEST LINE OF ABOVE DESCRIBED REAL ESTATE. ALL AS SHOWN ON THE PLAT OF SURVEY AS PREPARED BY LOWELL H. LOVING, ILLINOIS REGISTERED LAND SURVEYOR NO. 1716, AND DATED AUGUST 23, 1983

A PARCEL OF LAND SITUATED IN THE SOUTH HALF OF THE NORTHEAST QUARTER OF SECTION 3, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHEAST CORNER OF THE SOUTH HALF OF THE NORTHEAST QUARTER OF SAID SECTION 3; THENCE SOUTH ALONG THE EAST LINE OF SAID SECTION ON A LOCAL AZIMUTH OF 177 DEGREES 51

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MINUTES 40 SECONDS, 50.2 FEET TO THE CENTER LINE OF A PUBLIC ROAD COMMONLY KNOWN AS THE HUBBARD TRAIL ROAD, FOR A PLACE OF BEGINNING; THENCE SOUTH ALONG THE AFORESAID LINE 307.61 FEET; THENCE ON AN AZIMUTH OF 230 DEGREES 58 MINUTES 29 SECONDS 231.24 FEET; THENCE ON AN AZIMUTH OF 270 DEGREES 00 MINUTES, 100 FEET; THENCE ON AN AZIMUTH OF 211 DEGREES 49 MINUTES 40 SECONDS, 301.72 FEET; THENCE ON AN AZIMUTH OF 182 DEGREES 02 MINUTES 03 SECONDS, 475 FEET TO THE SOUTH LINE OF THE NORTHEAST QUARTER OF SAID SECTION; THENCE ALONG SAID LINE ON AN AZIMUTH OF 269 DEGREES 40 MINUTES 57 SECONDS, 252.21 FEET; THENCE ON AN AZIMUTH OF 02 DEGREES 02 MINUTES 03 SECONDS, 510.35 FEET, THENCE AROUND A CURVE TO THE RIGHT HAVING A RADIUS OF 311 FEET, A DELTA ANGLE OF 36 DEGREES 52 MINUTES 12 SECONDS, AN ARC DISTANCE OF 200.13 FEET TO A POINT OF REVERSE CURVE; THENCE AROUND A CURVE TO THE LEFT HAVING A RADIUS OF 274 FEET A DELTA ANGLE OF 40 DEGREES 16 MINUTES 22 SECONDS, AN ARC DISTANCE OF 192.59 FEET TO THE POINT OF TANGENCY; THENCE ON AN AZIMUTH OF 358 DEGREES 37 MINUTES 54 SECONDS 249.61 FEET; THENCE AROUND A CURVE TO THE LEFT HAVING A RADIUS OF 30.73 FEET, A DELTA ANGLE OF 88 DEGREES 37 MINUTES 53 SECONDS, AN ARC DISTANCE OF 47.53 FEET TO A POINT ON THE SOUTH RIGHT OF WAY LINE OF THE AFORESAID ROAD; THENCE ON AN AZIMUTH OF 00 DEGREES 00 MINUTES 33 FEET, TO THE CENTER OF THE AFORESAID ROAD; THENCE ON AN AZIMUTH OF 90 DEGREES 00 MINUTES ALONG SAID LINE 585.43 FEET TO THE PLACE OF BEGINNING, SAID EXCEPTION COMMONLY KNOWN AS BRAMBLE BUSH ESTATES, SITUATED IN VERMILION COUNTY, ILLINOIS

ALSO SAVE AND EXCEPT 2 PARCELS OF LAND CONVEYED TO HOOPESTON WIND, LLC, IN WARRANTY DEED, DATED MAY 9, 2014, RECORDED MAY 20, 2014, AS DOCUMENT NO. 14-03553, OFFICIAL PUBLIC RECORDS, VERMILION COUNTY, ILLINOIS, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

SWITCHYARD PARCEL

A PART OF THE NORTHWEST QUARTER, TOGETHER WITH A PART OF THE NORTHEAST QUARTER OF SECTION 3, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, MORE PARTICULARLY DESCRIBED AS FOLLOWS: BEGINNING AT THE SOUTHEAST CORNER OF SAID NORTHWEST QUARTER OF SECTION 3 AND RUNNING; THENCE NORTH 02°39'14" WEST, ALONG THE EAST LINE OF SAID NORTHWEST QUARTER BEING ALSO THE WEST LINE OF SAID NORTHEAST QUARTER, 276.85 FEET; THENCE NORTH 89°16'45" EAST, 45.02 FEET; THENCE NORTH 02°39'14" WEST, PARALLEL WITH SAID WEST LINE OF THE NORTHEAST QUARTER, 867.52 FEET; THENCE NORTH 89°03'47" EAST,

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30.01 FEET; THENCE NORTH 02°39'14" WEST, PARALLEL WITH SAID WEST LINE OF THE NORTHEAST QUARTER, 75.03 FEET, TO THE NORTH LINE OF THE SOUTH HALF OF SAID NORTHEAST QUARTER OF SECTION 3; THENCE SOUTH 89°03'47" WEST, ALONG SAID NORTH LINE, 45.02 FEET; THENCE SOUTH 02°39'14" EAST, PARALLEL WITH SAID WEST LINE OF THE NORTHEAST QUARTER, 752.39 FEET; THENCE SOUTH 89°16'45" WEST, PARALLEL WITH THE SOUTH LINE OF SAID NORTHEAST QUARTER, BEING ALSO COMMON WITH THE SOUTH LINE OF SAID NORTHWEST QUARTER, 496.96 FEET; THENCE SOUTH 02°39'14" EAST, PARALLEL WITH SAID EAST LINE OF THE NORTHWEST QUARTER, 466.96 FEET, TO A POINT ON SAID SOUTH LINE OF THE NORTHWEST QUARTER; AND THENCE NORTH 89°16'45" EAST, ALONG SAID SOUTH LINE, 466.96 FEET, TO THE POINT OF BEGINNING

CONTAINING 240015.69 SQUARE FEET OR 5.51 ACRES OF LAND MORE OR LESS

SUBSTATION PARCEL

A PART OF THE NORTHWEST QUARTER, TOGETHER WITH A PART OF THE NORTHEAST QUARTER OF SECTION 3, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, MORE PARTICULARLY DESCRIBED AS FOLLOWS: COMMENCING AT THE SOUTHEAST CORNER OF SAID NORTHWEST QUARTER OF SECTION 3 AND RUNNING; THENCE NORTH 02°39'14" WEST, ALONG THE EAST LINE OF SAID NORTHWEST QUARTER BEING ALSO THE WEST LINE OF SAID NORTHEAST QUARTER, 466.96 FEET, TO THE POINT OF BEGINNING; THENCE SOUTH 89°16'45" WEST, PARALLEL WITH THE SOUTH LINE OF SAID NORTHWEST QUARTER, 466.96 FEET; THENCE NORTH 02°39'14" WEST, PARALLEL WITH THE EAST LINE OF SAID NORTHWEST QUARTER, 419.19 FEET; THENCE NORTH 89°14'49" EAST, PARALLEL WITH SAID SOUTH LINE OF THE NORTHWEST QUARTER, 466.96 FEET, TO A POINT ON SAID EAST LINE OF THE NORTHWEST QUARTER; THENCE NORTH 02°39'14" WEST, ALONG SAID EAST LINE, 332.81 FEET, TO THE NORTHWEST CORNER OF THE SOUTH HALF OF SAID NORTHEAST QUARTER OF SECTION 3; THENCE NORTH 89°03'47" EAST, ALONG THE NORTH LINE OF SAID SOUTH HALF, 30.01 FEET; THENCE SOUTH 02°39'14 WEST, PARALLEL WITH THE WEST LINE OF SAID NORTHEAST QUARTER, 752.39 FEET; AND THENCE SOUTH 89°16'45" WEST, 30.01 FEET, TO THE POINT OF BEGINNING

CONTAINING 218265.11 SQUARE FEET OR 5.01 ACRES OF LAND MORE OR LESS

PIN 08-03-200-003
PIN 08-03-200-004

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PARCEL 6

SUBSTATION PARCEL

A PART OF THE NORTHWEST QUARTER, TOGETHER WITH A PART OF THE NORTHEAST QUARTER OF SECTION 3, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, MORE PARTICULARLY DESCRIBED AS FOLLOWS: COMMENCING AT THE SOUTHEAST CORNER OF SAID NORTHWEST QUARTER OF SECTION 3 AND RUNNING; THENCE NORTH 02°39'14" WEST, ALONG THE EAST LINE OF SAID NORTHWEST QUARTER BEING ALSO THE WEST LINE OF SAID NORTHEAST QUARTER, 466.96 FEET, TO THE POINT OF BEGINNING; THENCE SOUTH 89°16'45" WEST, PARALLEL WITH THE SOUTH LINE OF SAID NORTHWEST QUARTER, 466.96 FEET; THENCE NORTH 02°39'14" WEST, PARALLEL WITH THE EAST LINE OF SAID NORTHWEST QUARTER, 419.19 FEET; THENCE NORTH 89°14'49" EAST, PARALLEL WITH SAID SOUTH LINE OF THE NORTHWEST QUARTER, 466.96 FEET, TO A POINT ON SAID EAST LINE OF THE NORTHWEST QUARTER; THENCE NORTH 02°39'14" WEST, ALONG SAID EAST LINE, 332.81 FEET, TO THE NORTHWEST CORNER OF THE SOUTH HALF OF SAID NORTHEAST QUARTER OF SECTION 3; THENCE NORTH 89°03'47" EAST, ALONG THE NORTH LINE OF SAID SOUTH HALF, 30.01 FEET; THENCE SOUTH 02°39'14 WEST, PARALLEL WITH THE WEST LINE OF SAID NORTHEAST QUARTER, 752.39 FEET; AND THENCE SOUTH 89°16'45" WEST, 30.01 FEET, TO THE POINT OF BEGINNING

CONTAINING 218265.11 SQUARE FEET OR 5.01 ACRES OF LAND MORE OR LESS

PIN PART OF 08-03-100-001 AND PART OF 08-03-200-003

Lease 007
IL-HOO-007
Charles Maxwell

WEST 20 ACRES OF THE SOUTH 50 ACRES OF THE SOUTHWEST QUARTER OF SECTION 6, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-06-300-003

Lease 008
IL-HOO-008
Curtis Orr (Parcels 1-5)
Randie Orr and Tamara Orr (Parcel 6)

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PARCEL 1

THE WEST HALF OF THE NORTHEAST QUARTER OF SECTION 35, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 02-35-200-001

PARCEL 2

THE NORTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 2, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS.

PIN 07-02-300-001

PARCEL 3

THE NORTH HALF OF THE SOUTHEAST QUARTER AND THE NORTHEAST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 2, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 07-02-400-001

PARCEL 4

COMMENCING AT THE SOUTHEAST CORNER OF THE NORTHEAST QUARTER OF SECTION 2, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, THENCE NORTH 64 RODS, THENCE WEST 100 RODS, THENCE SOUTH 64 RODS, THENCE EAST TO THE PLACE OF BEGINNING

ALSO,

20 ACRES OUT OF THE NORTHEAST QUARTER OF SAID SECTION 2, DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF THE NORTHEAST QUARTER OF SAID SECTION 2, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, THENCE EAST 60 RODS, THENCE NORTH 53 1/3 RODS, THENCE WEST 60 RODS, THENCE SOUTH 53 1/3 RODS TO THE PLACE OF BEGINNING

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SAVE AND EXCEPT SUCH PART AS MAY BE INCLUDED IN THE FOLLOWING DESCRIBED LAND:

BEGINNING AT THE NORTHEAST CORNER OF SAID SECTION 2, THENCE WEST 160 RODS TO THE NORTHWEST CORNER OF THE NORTHEAST QUARTER OF SAID SECTION 2, THENCE SOUTH 107 RODS, THENCE EAST 60 RODS, THENCE NORTH 11 RODS, THENCE EAST 100 RODS TO THE EAST LINE OF SAID SECTION 2, THENCE NORTH ON SAID SECTION LINE 96 RODS TO THE PLACE OF BEGINNING

ALSO SAVE AND EXCEPT

ROADWAY 1 ½ RODS WIDE OFF THE WEST SIDE THEREOF, VERMILION COUNTY, ILLINOIS

PIN 07-02-200-002

PARCEL 5

THE NORTHWEST QUARTER OF SECTION 2, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT

THE EAST 29 ACRES THEREOF

ALSO SAVE AND EXCEPT

THE EAST 523 FEET OF THE WEST 1,614 FEET OF THE NORTH 250 FEET

ALSO SAVE AND EXCEPT

THE WEST 1 ½ RODS THEREOF

ALSO SAVE AND EXCEPT

A PARCEL OF LAND CONVEYED TO THE STATE OF ILLINOIS, DEPARTMENT OF TRANSPORTATION, IN WARRANTY DEED RECORDED JANUARY 3, 1990, AS DOCUMENT NO. 90-776, OFFICIAL PUBLIC RECORDS, VERMILION COUNTY, ILLINOIS, AND MORE PARTICULARLY DESCRIBED AS FOLLOWS:

A PARCEL OF LAND BEING PART OF THE NORTHWEST QUARTER OF SECTION 2, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, DESCRIBED AS FOLLOWS:

Thomas O'Shaughnessy Vermilion County Recorder Doc # 14-09577 Page 13 OF 71

UNOFFICIAL COPY

COMMENCING AT THE SOUTHWEST CORNER OF THE NORTHWEST QUARTER OF SAID SECTION 2, THENCE NORTH 89 DEGREES 03 MINUTES 14 SECONDS EAST FOR 5.59 FEET, THENCE NORTH 0 DEGREES 56 MINUTES 46 SECONDS WEST FOR 738.03 FEET ALONG THE CENTERLINE OF FAS ROUTE 331, THENCE NORTH 0 DEGREES 56 MINUTES 46 SECONDS EAST FOR 30.00 FEET TO THE PLACE OF BEGINNING, FROM THE PLACE OF BEGINNING ON THE EAST RIGHT OF WAY LINE OF FAS ROUTE 331 (CH 10), THENCE NORTH 0 DEGREES 56 MINUTES 46 SECONDS WEST FOR 70.00 FEET ALONG A LINE LYING 30 FEET EAST OF AND PARALLEL WITH THE CENTERLINE OF FAS ROUTE 331, THENCE SOUTH 42 DEGREES 22 MINUTES 11 SECONDS EAST FOR 45.34 FEET, THENCE SOUTH 38 DEGREES 51 MINUTES 34 SECONDS WEST FOR 46.86 FEET TO THE PLACE OF BEGINNING, CONTAINING 0.024 OF AN ACRE, MORE OR LESS

PINS 07-02-100-001 and 07-02-100-002

PARCEL 6

THE EAST 523 FEET OF THE WEST 1614 FEET OF THE NORTH 250 FEET OF THE NORTHWEST QUARTER OF SECTION 2, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE NORTH LINE OF SECTION 2, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, THAT IS 1614 FEET EAST OF THE NORTHWEST CORNER OF SAID SECTION 2, THENCE SOUTH 250 FEET PERPENDICULAR TO SAID NORTH LINE OF SECTION 2, THENCE WEST 523 FEET PARALLEL WITH SAID NORTH LINE OF SECTION 2, THENCE NORTH 90 DEGREES 00 MINUTES WITH THE PRECEDING COURSE A DISTANCE OF 250 FEET TO THE SECTION LINE, THENCE EAST 523 FEET TO THE POINT OF BEGINNING

PIN 07-02-100-003

Lease 009
IL-HOO-009
Debbie Maxwell

THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 4, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, 27.62 ACRES, MORE OR LESS

PIN 08-04-100-001

UNOFFICIAL COPY

Lease 010
IL-HOO-010
Derick Stewart

THE EAST 20 ACRES OF THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER, SECTION 11, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 07-11-400-001

Lease 011
IL-HOO-011
Dewain J. Moore, Trustee of the Dewain J. Moore Trust

THE NORTHWEST QUARTER OF SECTION 1, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 07-01-100-001

Lease 012
IL-HOO-012
Russell T. Williams, Trustee of the Russell Williams Trust and of the Maxine Williams Trust

THE SOUTH ¾ OF THE WEST HALF OF SECTION 25, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

ALSO KNOWN AS:

SOUTH HALF OF THE NORTHWEST QUARTER OF SECTION 25, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 02-25-100-002

SOUTHWEST QUARTER OF SECTION 25, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 02-25-300-001

ALSO DESCRIBED AS FOLLOWS:

UNOFFICIAL COPY

THE SOUTH ¼ OF THE WEST HALF OF SECTION 25, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

Lease 013
IL-HOO-013
Betty Jo Hartter
Bonita J. Frank

THE NORTH HALF OF THE NORTHEAST QUARTER OF SECTION 1, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PINS 07-01-200-001 & 07-01-200-003

Lease 014
IL-HOO-014
James P. Hatfield & Caryn M. Hatfield

PARCEL 1

ALL THAT PART OF THE WEST HALF OF THE NORTHEAST FRACTIONAL QUARTER ALSO KNOWN AS THE WEST HALF OF GOVERNMENT LOTS 1 AND 2 OF THE NORTHEAST FRACTIONAL QUARTER OF SECTION 6, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN THAT LIES SOUTH OF THE PUBLIC ROAD, VERMILION COUNTY, ILLINOIS

PIN 08-06-200-002

PARCEL 2

ALL THAT PART OF THE NORTHEAST QUARTER OF THE NORTHEAST FRACTIONAL QUARTER, ALSO KNOWN AS THE EAST HALF OF GOVERNMENT LOT 2 OF THE NORTHEAST FRACTIONAL QUARTER OF SECTION 6, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN., THAT LIES SOUTH OF THE PUBLIC ROAD, VERMILION COUNTY, ILLINOIS

PIN 08-06-200-001

PARCEL 3

THE EAST HALF OF LOT 1 OF THE NORTHEAST QUARTER OF SECTION 6 TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN., VERMILION COUNTY, ILLINOIS

UNOFFICIAL COPY

SAVE AND EXCEPT

BEGINNING AT THE SOUTHEAST CORNER OF THE NORTHEAST QUARTER OF SAID SECTION 6, THENCE WEST ALONG THE SOUTH LINE OF SAID QUARTER SECTION 306 FEET; THENCE NORTH 340 FEET, THENCE EAST 306 FEET TO THE CENTER OF THE PUBLIC ROAD, THENCE SOUTH 340 FEET TO THE PLACE OF BEGINNING, VERMILION COUNTY, ILLINOIS,

PIN 08-06-200-003

Lease 015
IL-HOO-015
Howard W. Robinson, Trustee of the Trust #99-1 (Parcel 1)
Howard W. Robinson and Carolyn Robinson, Life Estates
Ann R. Phillips, Carol C. Edmund, and Elizabeth Jane Jacobs, Trustee of the Elizabeth Jane Jacobs Trust, Remaindermen

PARCEL 1

THE NORTHEAST QUARTER OF SECTION 34, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT:

A PARCEL OF LAND BEING PART OF THE NORTHEAST QUARTER OF SECTION 34, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHEAST CORNER OF THE NORTHEAST QUARTER OF SAID SECTION 34; THENCE SOUTH 88 DEGREES 40 MINUTES 19 SECONDS WEST FOR 28.92 FEET ALONG THE NORTH LINE OF SAID SECTION 34; THENCE SOUTH 02 DEGREES 08 MINUTES 42 SECONDS WEST FOR 27.67 FEET TO THE PLACE OF BEGINNING; FROM THE PLACE OF BEGINNING THENCE AROUND A CURVE TO THE LEFT HAVING A RADIUS OF 111,318.40 FEET, A LENGTH OF 455.00 FEET AND A CHORD BEARING OF SOUTH 02 DEGREES 01 MINUTE 39 SECONDS EAST BEING THE EXISTING WEST RIGHT OF WAY LINE OF FAS ROUTE 331; THENCE SOUTH 02 DEGREES 08 MINUTES 41 SECONDS EAST FOR 2,136.62 FEET; THENCE SOUTH 88 DEGREES 42 MINUTES 27 SECONDS WEST FOR 10.00 FEET ALONG THE SOUTH LINE OF THE NORTHEAST QUARTER OF SAID SECTION 34; THENCE NORTH 02 DEGREES 08 MINUTES 41 SECONDS WEST FOR 2,136.47 FEET ALONG A LINE LYING 40 FEET WEST OF AND PARALLEL WITH THE CENTERLINE OF FAS ROUTE 331; THENCE AROUND A CURVE TO THE RIGHT HAVING A RADIUS OF 111,328.40 A LENGTH OF

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455.14 FEET AND A CHORD BEARING OF NORTH 02 DEGREES 01 MINUTE 39 SECONDS WEST; THENCE NORTH 88 DEGREES 40 MINUTES 19 SECONDS EAST FOR 10.00 FEET ALONG THE SOUTH RIGHT OF WAY LINE OF THE REILLY ROAD (T.R. 31) THAT LIES ON THE NORTH SIDE OF SAID SECTION 34 TO THE PLACE OF BEGINNING CONTAINING 0.595 OF AN ACRE, MORE OR LESS

PIN 02-34-200-001

PARCEL 2

THE SOUTHEAST QUARTER OF SECTION 34, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT:

A PARCEL OF LAND BEING PART OF THE SOUTHEAST QUARTER OF SECTION 34, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTHEAST CORNER OF THE SOUTHEAST QUARTER OF SAID SECTION 34; THENCE NORTH 02 DEGREES 08 MINUTES 42 SECONDS WEST FOR 1,991.52 FEET ALONG THE EAST LINE OF SAID SECTION 34; THENCE SOUTH 88 DEGREES 42 MINUTES 27 SECONDS WEST FOR 29.86 FEET TO THE PLACE OF BEGINNING; FROM THE PLACE OF BEGINNING THENCE SOUTH 87 DEGREES 51 MINUTES, 19 SECONDS WEST FOR 10.00 FEET; THENCE NORTH 02 DEGREES 08 MINUTES 41 SECONDS WEST FOR 627.95 FEET ALONG A LINE LYING 40 FEET WEST OF AND PARALLEL WITH THE CENTERLINE OF FAS ROUTE 331 (CH 10); THENCE NORTH 88 DEGREES 42 MINUTES 27 SECONDS EAST FOR 10.00 FEET ALONG THE NORTH LINE OF THE SOUTHEAST QUARTER OF SAID SECTION 34; THENCE SOUTH 02 DEGREES 08 MINUTES 41 SECONDS EAST FOR 627.80 FEET ALONG THE EXISTING WEST RIGHT OF WAY LINE OF FAS ROUTE 331 TO THE PLACE OF BEGINNING, CONTAINING 0.144 OF AN ACRE, MORE OR LESS

PIN 02-34-400-001

Lease 016
IL-HOO-016
Jean E. Stewart and Cheryl D. Stewart, Co-Trustees of the Jean and Cheryl Stewart Living Trust

PARCEL 1

UNOFFICIAL COPY

Permits Douglas County
541-442-1377

THE WEST 20 ACRES OF THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 11, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 07-11-400-005

541-442-4559 # Permit for 1377

PARCEL 2

THE SOUTH HALF OF THE NORTH HALF OF THE NORTHWEST QUARTER OF SECTION 12, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT ANY PORTION THEREOF FALLING WITHIN THE FOLLOWING:

BEGINNING ON THE SOUTH LINE OF THE NORTHWEST QUARTER OF SAID SECTION 12, 925.4 FEET WEST OF THE CENTER OF SAID SECTION; RUNNING THENCE WEST 438.6 FEET ON SAID SOUTH LINE; THENCE NORTH 89 DEGREES 15 MINUTES TO THE RIGHT 1346.7 FEET; THENCE 91 DEGREES 13 MINUTES TO THE RIGHT 431.5 FEET; THENCE SOUTHERLY 1343.3 FEET TO THE PLACE OF BEGINNING, VERMILION COUNTY, ILLINOIS

PIN 07-12-100-004

PARCEL 3

THE EAST HALF OF THE NORTHEAST QUARTER OF SECTION 11, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 07-11-200-002

Lease 017
IL-HOO-017
Forest Peters, Jr., Mary E. Peters and Joe A. Peters

PARCEL 1

THE SOUTH 20 ACRES OF THE WEST HALF OF THE NORTHWEST QUARTER OF SECTION 36, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 02-36-100-003

UNOFFICIAL COPY

PARCEL 2

THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 36, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 02-36-300-001

PARCEL 3

THE NORTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 36, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 02-36-300-004

PARCEL 4

THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 36, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, EXCEPT THE NORTH 25 ACRES THEREOF

PIN 02-36-400-003

PARCEL 5

THE NORTHEAST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 36, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 02-36-300-002

Lease 018
IL-HOO-018
Larry Betka and Carol Betka

THE NORTH HALF OF THE SOUTHWEST QUARTER OF SECTION 33, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 02-33-300-003

UNOFFICIAL COPY

Lease 019
IL-HOO-019
Joyce E. Williams

THE WEST HALF OF THE NORTHWEST QUARTER OF SECTION 36, (EXCEPT THE SOUTH 20 ACRES THEREOF) TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 02-36-100-001

Lease 020
IL-HOO-020
LaVerne A. O'Hare, Life Estate
Debra O. Short, Remainderman

THE NORTHEAST QUARTER OF SECTION 12, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT

BEGINNING AT A POINT ON THE SOUTH LINE THEREOF, 1978 FEET WEST OF THE SOUTHEAST CORNER OF SAID NORTHEAST QUARTER; THENCE NORTH AT RIGHT ANGLES TO SAID SOUTH LINE, 435.6 FEET; THENCE WEST PARALLEL WITH SAID SOUTH LINE, 200 FEET; THENCE SOUTH AT RIGHT ANGLES TO THE LAST DESCRIBED COURSE, 435.6 FEET TO THE SOUTH LINE OF SAID NORTHEAST QUARTER; THENCE EAST 200 FEET TO THE POINT OF BEGINNING; ALSO EXCEPT BEGINNING 1838 FEET WEST OF THE SOUTHEAST CORNER OF THE NORTHEAST QUARTER OF SAID SECTION TWELVE, RUNNING THENCE WEST, 180 FEET ON THE SOUTH LINE OF SAID NORTHEAST QUARTER; THENCE 90 DEGREES 00 MINUTES TO THE RIGHT, 252 FEET; THENCE EAST 140 FEET PARALLEL WITH SAID SOUTH LINE; THENCE SOUTH 252 FEET TO THE PLACE OF BEGINNING, SITUATED IN VERMILION COUNTY, ILLINOIS

PIN 07-12-200-001

Lease 021
IL-HOO-021
1st Source Bank, Successor Trustee of the Alice P. Hammerton Living Trust

UNOFFICIAL COPY

THE EAST HALF OF THE SOUTHEAST QUARTER OF SECTION 33, TOWNSHIP 23 NORTH, RANGE 13 WEST, CONTAINING 80 ACRES, MORE OR LESS, BUTLER TOWNSHIP, VERMILION COUNTY, ILLINOIS

PIN 02-33-400-002

Lease 022
IL-HOO-022
Lois Lee Petersen

PARCEL 1

THE SOUTH 1344.6 FEET OF EVEN WIDTH OF THE SOUTH HALF OF SECTION 1, TOWNSHIP 22, NORTH OF THE BASE LINE, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT A TRACT DESCRIBED AS FOLLOWS

BEGINNING AT THE SOUTHEAST CORNER OF THE SOUTH HALF OF SAID SECTION 1, THENCE NORTH ON THE EAST SECTION LINE A DISTANCE OF 590 FEET FOR A PLACE OF BEGINNING, THENCE CONTINUING NORTH ON THE EAST SECTION LINE A DISTANCE OF 396 FEET, THENCE WEST PARALLEL WITH THE SOUTH SECTION LINE A DISTANCE OF 570 FEET, THENCE SOUTH PARALLEL WITH THE EAST SECTION LINE A DISTANCE OF 396 FEET, THENCE EAST PARALLEL WITH THE SOUTH SECTION LINE A DISTANCE OF 570 FEET TO THE PLACE OF BEGINNING, CONTAINING 5.18 ACRES, MORE OR LESS

PIN 07-01-300-003
PIN 07-01-400-006

PARCEL 2

THE NORTH 858.7 FEET OF EVEN WIDTH OF THE SOUTH 1743.35 FEET OF EVEN WIDTH OF THE SOUTHWEST QUARTER OF SECTION 6, TOWNSHIP 22, NORTH OF THE BASE LINE, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN; SITUATED IN VERMILION COUNTY, ILLINOIS

PIN 08-06-300-006
PIN 08-06-300-008

Lease 023
IL-HOO-023
Lucinda M. Barnes, Trustee of the Lucinda M. Barnes Trust

UNOFFICIAL COPY

THE WEST HALF OF THE FOLLOWING DESCRIBED TRACT OF LAND:

THE WEST HALF OF THE NORTHEAST QUARTER OF SECTION 7 AND THE EAST 35 ACRES OF THE EAST SIDE OF THE NORTHWEST QUARTER OF SECTION 7, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPLE MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-07-100-005

Lease 024
IL-HOO-024
Lynn E. Green and John D. Green, Life Estates
Paula L. Green, Kristi L. Maged, and Michael John Green, Remaindermen

PARCEL 1

THE SOUTHWEST QUARTER OF SECTION 6, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT:

THE SOUTH 1743.35 FEET OF EVEN WIDTH OF SAID SOUTHWEST QUARTER OF SECTION 6, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

ALSO SAVE AND EXCEPT

A TRACT CONVEYED TO THERESA JOHNSON IN QUIT CLAIM DEED RECORDED SEPTEMBER 12, 1997, AS DOCUMENT 97-0009576, AND MORE PARTICULARLY DESCRIBED AS FOLLOWS:

PART OF THE SOUTHWEST FRACTION QUARTER OF SECTION 6, TOWNSHIP 22, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, DESCRIBED AS FOLLOWS:

BEGINNING 550 FEET SOUTH OF THE NORTHWEST CORNER OF THE SOUTHWEST QUARTER, THENCE NORTH 330 FEET, EAST 330 FEET, SOUTH 330 FEET, WEST 330 FEET, TO THE PLACE OF BEGINNING

COMPRISING 48.658 ACRES, MORE OR LESS

PIN 08-06-300-009

PARCEL 2

UNOFFICIAL COPY

THE SOUTH HALF OF SECTION 1, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT

THE SOUTH 1344.6 FEET OF EVEN WIDTH OF SAID SOUTH HALF

COMPRISING 158.349 ACRES, MORE OR LESS

PIN 07-01-400-005

Lease 025
IL-HOO-025
Mann Brothers Inc.

PARCEL 1

THE SOUTH 50 ACRES OF THE EAST HALF OF THE SOUTHEAST QUARTER OF SECTION 7, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, CONTAINING 50 ACRES, MORE OR LESS

PIN 08-07-400-002

PARCEL 2

THE WEST HALF OF THE SOUTHWEST QUARTER OF SECTION 7, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-07-300-001

PARCEL 3

THE NORTH HALF OF SECTION 18, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-18-100-001

PARCEL 4

THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 18, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

UNOFFICIAL COPY

PIN 08-18-400-001

PARCEL 5

THE NORTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 18, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-18-400-002

Lease 026
IL-HOO-026
Marilyn J. Moore, Trustee of Marilyn J. Moore Trust

PARCEL 1

THE WEST HALF OF THE SOUTHEAST QUARTER AND THE EAST HALF OF THE SOUTHWEST QUARTER, SECTION 35, TOWNSHIP 23 NORTH, RANGE 13 WEST, 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 02-35-300-002

PARCEL 2

THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 2, TOWNSHIP 22 NORTH, RANGE 13 EAST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

ALSO KNOWN AS:

THE SOUTH HALF OF THE SOUTHEAST QUARTER OF FRACTIONAL SECTION 2, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 07-02-400-002

Lease 027
IL-HOO-027
Lawrence R. Alt and James P. Alt, Co-Trustees of the Brian A. Alt Trust (Parcel 1)
Mark E. Alt and Kristin L. Alt, Trustees of the Mark E. Alt and Kristin L. Alt Trust (Parcel 2)

UNOFFICIAL COPY

PARCEL 1

THE WEST HALF OF THE SOUTHEAST QUARTER OF SECTION 33, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN SITUATED IN VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT:

THE EAST 17.29 ACRES OF THE WEST HALF OF THE SOUTHEAST QUARTER OF SECTION 33, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, SITUATED IN VERMILION COUNTY, ILLINOIS

PARCEL 2

THE EAST 17.29 ACRES OF THE WEST HALF OF THE SOUTHEAST QUARTER OF SECTION 33, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, SITUATED IN VERMILION COUNTY, ILLINOIS

PIN 02-33-400-001

Lease 028
IL-HOO-028
Donna J Mason, Trustee of the Donna J. Mason Revocable Trust, Life Estate
John C. Mason, Jr., Trustee of the John C. Mason Jr. Revocable Trust, Life Estate
John Charles Mason, Remainderman, an undivided ¼ interest
Jeffrey Cole Mason, Remainderman, an undivided ¼ interest
Michael Lewis Mason, Remainderman, an undivided ¼ interest
Steven Christopher Mason, Remainderman, an undivided ¼ interest

THE SOUTH HALF OF THE NORTHEAST QUARTER OF SECTION 8, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, CONTAINING 80 ACRES, MORE OR LESS

PIN 08-08-200-003

Lease 029
IL-HOO-029
DocsFarms LLC

PARCEL 1

UNOFFICIAL COPY

THE SOUTHWEST QUARTER OF SECTION 4, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT

BEGINNING AT THE NORTHWEST CORNER OF SAID SOUTHWEST QUARTER, THENCE EAST 93 RODS AND 23 LINKS, THENCE SOUTH 70 RODS AND 12 LINKS, THENCE WEST 93 RODS AND 23 LINKS, THENCE NORTH TO THE PLACE OF BEGINNING

ALSO SAVE AND EXCEPT

THE NORTH HALF OF THE NORTHEAST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION 4, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-04-300-002

PARCEL 2

THE SOUTHEAST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 5, AND THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 5, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-05-400-002

Lease 030
IL-HOO-030
William M. Blair, Jr., Trustee of the Blair Siblings Trust

PARCEL 1

THE NORTH THREE QUARTER OF THE NORTHEAST QUARTER OF SECTION 3, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 07-03-200-001

PARCEL 2

THE NORTH HALF OF THE SOUTHEAST QUARTER OF SECTION 3, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

UNOFFICIAL COPY

PIN 07-03-400-001

PARCEL 3

THE SOUTH ONE QUARTER OF THE NORTHEAST QUARTER OF SECTION 3, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 07-03-200-002

Lease 031
IL-HOO-031
Olson Acres, LLC

PARCEL 1

THE EAST HALF OF THE NORTHEAST QUARTER OF SECTION 4, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-04-200-001

PARCEL 2

THE WEST HALF OF THE NORTHEAST QUARTER OF SECTION 4, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-04-200-002

Lease 032
IL-HOO-032
The Gernand Family Limited Partnership

PARCEL 1

THE SOUTHEAST QUARTER OF THE NORTHEAST QUARTER OF SECTION 7, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-07-200-003

UNOFFICIAL COPY

PARCEL 2

THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER OF SECTION 7, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-07-200-002

PARCEL 3

PART OF THE NORTHEAST QUARTER AND PART OF THE NORTHWEST QUARTER OF SECTION 7, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, DESCRIBED AS FOLLOWS:

THE EAST HALF OF THE FOLLOWING DESCRIBED TRACT OF LAND:

THE WEST HALF OF THE NORTHEAST QUARTER OF SECTION 7 AND ALSO 35 ACRES OFF OF THE EAST SIDE OF THE NORTHWEST QUARTER OF SECTION 7, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT:

PART OF THE NORTHEAST QUARTER OF SECTION 7, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, DESCRIBED AS FOLLOWS:

BEGINNING ON THE SOUTH LINE OF THE NORTHEAST QUARTER OF SAID SECTION, A DISTANCE OF 1,659.00 FEET WEST OF THE SOUTHEAST CORNER OF SAID NORTHEAST QUARTER, THENCE WEST 275.000 FEET ON SAID SOUTH LINE, THENCE DEFLECTING 88 DEGREES 10.0 MINUTES TO THE RIGHT 448.50 FEET, THENCE EAST 275 FEET PARALLEL WITH SAID SOUTH LINE AND THENCE SOUTHERLY 448.50 FEET TO THE POINT OF BEGINNING, HAVING PIN 08-07-200-006-021 WITH A COMMON ADDRESS OF 3550 NORTH ROAD WEST OF 1090 EAST ROAD IN THE WEST PART OF ROSS TOWNSHIP, VERMILION COUNTY, ILLINOIS, CONTAINING 54.67 ACRES, MORE OR LESS

ALSO SAVE AND EXCEPT

PART OF THE NORTHEAST QUARTER OF SECTION 7, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, DESCRIBED AS FOLLOWS:

UNOFFICIAL COPY

THE HOUSE SITE COMMON ADDRESS AS 3550 NORTH ROAD WEST OF 1090 EAST ROAD WEST IN ROSS TOWNSHIP, VERMILION COUNTY, ILLINOIS

PIN 08-07-200-006

Lease 033
IL-HOO-033
Philip D. Duncan and Sondra M. Duncan

THE NORTHWEST QUARTER OF SECTION 11, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT

A PARCEL OF LAND CONVEYED TO THE STATE OF ILLINOIS BY DEED DATED APRIL 30, 1930, RECORDED MARCH 30, 1931, IN BOOK 389 PAGE 105, AS DOCUMENT NO. 345824, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT "A" A STONE AT THE NORTHWEST CORNER OF THE NORTHWEST QUARTER OF SECTION 11, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, THENCE EAST 30 FEET TO "B" THENCE SOUTH 2620 FEET TO "C" THENCE WEST 30 FEET WEST TO "D" THENCE NORTH 2620 FEET TO THE POINT OF BEGINNING "A" EXCEPT THAT PORTION LYING WITH THE PRESENT HIGHWAY

AND FURTHER SAVE AND EXCEPT

A PARCEL OF LAND CONVEYED TO THE STATE OF ILLINOIS BY DEED DATED DECEMBER 26, 1933, RECORDED JANUARY 25, 1934, IN BOOK 395, PAGE 257, AS DOCUMENT NO. 366309, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

FROM THE POINT OF BEGINNING "A" WHICH IS IN THE SOUTHWEST CORNER OF THE NORTHWEST QUARTER OF SECTION 1, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, THENCE NORTHERLY 30 FEET TO POINT "B" THENCE EASTERLY 2660 FEET TO POINT "C" THENCE SOUTHERLY 30 FEET TO POINT "D" THENCE WESTERLY 2660 FEET TO THE POINT OF BEGINNING, "A" EXCEPT THAT PORTION LYING WITHIN THE LIMITS OF THE PRESENT HIGHWAY

ALL OF THE ABOVE DESCRIBED TRACT OF LAND LIES IN THE SOUTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 11, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

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PIN 07-11-100-001

Lease 034
IL-HOO-034
Randie Orr and Tamara Orr

PARCEL 1

THE EAST HALF OF THE NORTHEAST QUARTER OF SECTION 35, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT:

BEGINNING ON THE NORTH LINE OF THE NORTHEAST QUARTER OF SECTION 35, TOWNSHIP 23 NORTH OF THE BASE LINE, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN A DISTANCE OF 1960.0 FEET EAST OF THE NORTHWEST CORNER OF SAID NORTHEAST QUARTER; THENCE EAST 375.5 FEET ON SAID NORTH LINE; THENCE SOUTHERLY 290.0 FEET AT RIGHT ANGLES; THENCE WEST 375.5 FEET PARALLEL WITH SAID NORTH LINE; AND THENCE NORTHERLY 290.0 FEET TO THE PLACE OF BEGINNING; ENCOMPASSING 2.500 ACRES IN THE EAST HALF OF SAID NORTHEAST QUARTER

PIN 02-35-200-004

PARCEL 2

THE EAST 29 ACRES OF THE NORTHWEST QUARTER OF SECTION 2, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 07-02-100-004

PARCEL 3

A PARCEL OF LAND DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHEAST CORNER OF SECTION 2, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, THENCE WEST 160 RODS TO THE NORTHWEST CORNER OF THE NORTHEAST QUARTER OF SAID SECTION 2, THENCE SOUTH 107 RODS, THENCE EAST 60 RODS, THENCE NORTH 11 RODS, THENCE EAST 100 RODS TO THE EAST LINE OF SAID SECTION 2, THENCE NORTH ON THE SECTION LINE 96 RODS TO THE PLACE OF BEGINNING

UNOFFICIAL COPY

SAVE AND EXCEPT A STRIP OF LAND 1 ½ RODS IN WIDTH OFF THE WEST SIDE OF THE NORTHEAST QUARTER OF SECTION 2, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 07-02-200-001

Lease 035
IL-HOO-035
Lorraine M. Tobeck, Trustee of the Lorraine M. Tobeck Trust and the Raymond H. Tobeck Trust

THE WEST FRACTIONAL HALF OF SECTION 3, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT

THE EAST 19 ACRES OFF THE SOUTHEAST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION 3 SITUATED IN VERMILION COUNTY, ILLINOIS

ALSO SAVE AND EXCEPT

PART OF THE SOUTHWEST QUARTER OF SECTION 3, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, DESCRIBED AS FOLLOWS:

BEGINNING ON THE SOUTH LINE OF THE SOUTHWEST QUARTER OF SAID SECTION 3, A DISTANCE OF 627.0 FEET WEST OF THE SOUTHEAST CORNER OF SAID SOUTHWEST QUARTER; THENCE NORTH 90 DEGREES 00.0 MINUTES WEST ALONG SAID SOUTH LINE 1724.8 FEET; THENCE NORTHEASTERLY AND EASTERLY THE FOLLOWING COURSES ALONG THE CENTER LINE OF A DRAINAGE DITCH; NORTH 60 DEGREES 26.65 MINUTES EAST 12.5 FEET; THENCE NORTH 44 DEGREES 11.75 MINUTES EAST 20.8 FEET; THENCE NORTH 35 DEGREES 29.9 MINUTES EAST 106.6 FEET; THENCE NORTH 34 DEGREES 31.2 MINUTES EAST 205.5 FEET; THENCE NORTH 32 DEGREES 53.55 MINUTES EAST 327.4 FEET; THENCE NORTH 51 DEGREES 13.55 MINUTES EAST 57.7 FEET; THENCE NORTH 75 DEGREES 55.8 MINUTES EAST 59.2 FEET; THENCE NORTH 88 DEGREES 51.55 MINUTES EAST 54.6 FEET; THENCE SOUTH 67 DEGREES 49.2 MINUTES EAST 37.4 FEET; THENCE SOUTH 64 DEGREES 57.4 MINUTES EAST 131.7 FEET; THENCE SOUTH 68 DEGREES 04.2 MINUTES EAST 51.2 FEET; THENCE SOUTH 69 DEGREES 50.4 MINUTES EAST 56.8 FEET; THENCE SOUTH 81 DEGREES 11.4 MINUTES EAST 166.5 FEET; THENCE SOUTH 88 DEGREES 14.15 MINUTES EAST 250.8 FEET; THENCE NORTH 81 DEGREES 09.35 MINUTES EAST 122.1 FEET; THENCE NORTH 76 DEGREES 06.35 MINUTES EAST 104.1 FEET; THENCE SOUTH 71 DEGREES 49.7 MINUTES EAST 41.2 FEET; THENCE SOUTH 53 DEGREES 44.3 MINUTES EAST 139.2 FEET; THENCE SOUTH 59 DEGREES 50.5 MINUTES EAST 70.2

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FEET; AND THENCE SOUTH 69 DEGREES 33.6 MINUTES EAST 95.0 FEET; AND THENCE SOUTH 0 DEGREES 14.85 MINUTES EAST PARALLEL WITH THE EAST LINE OF SAID SOUTHWEST QUARTER 342.0 FEET TO THE PLACE OF BEGINNING; ENCOMPASSING 17.487 ACRES MORE OR LESS, SITUATED IN VERMILION COUNTY, ILLINOIS

PINS 07-03-100-001 AND 07-03-300-002

Lease 036
IL-HOO-036
Robert Totheroh, Trustee of the Louise Totheroh Marital Trust and
Robert Totheroh, Trustee of the Totheroh Family Trust, an undivided 2/8 interest
Robert Totheroh, an undivided 2/8
Lillian L. Totheroh, an undivided 2/8 interest
Lillian L. Totheroh, Life Estate, an undivided 2/8
Gerald R. Totheroh, Timothy F. Totheroh, Sandra K. Satterwhite and Debra A. Kinnett, an undivided 2/8 interest, Remainderman

PARCEL 1

THE SOUTH 59 ACRES OF THE WEST HALF OF THE SOUTHEAST QUARTER OF SECTION 6, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

THE SOUTH 21 ACRES OF THE EAST HALF OF THE SOUTHEAST QUARTER OF SECTION 6, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-06-400-002

PARCEL 2

THE EAST 30 ACRES OF THE SOUTH 50 ACRES OF THE SOUTHWEST QUARTER OF SECTION 6, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-06-300-004
PIN 08-06-300-005

Lease 037
IL-HOO-037
Russell T. Williams, Trustee of the Russell Williams Trust and of the Maxine Williams Trust

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THE SOUTHEAST QUARTER OF THE SOUTHWEST QUARTER AND THE SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 36, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN;

SAVE AND EXCEPT: BEGINNING AT THE SOUTHEAST CORNER OF THE SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SAID SECTION 36; THENCE WEST 747 FEET; THENCE NORTH 478 FEET; THENCE EAST 153 FEET; THENCE NORTH TO THE NORTH LINE OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SAID SECTION 36; THENCE EAST 594 FEET; THENCE SOUTH TO THE PLACE OF BEGINNING;

ALSO SAVE AND EXCEPT:

BEGINNING AT A POINT 747 FEET WEST AND 478 FEET NORTH OF THE SOUTHEAST CORNER OF THE SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SAID SECTION 36; THENCE EAST 153 FEET; THENCE NORTH TO THE NORTH LINE OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SAID SECTION 36; THENCE WEST 153 FEET; THENCE SOUTH TO THE PLACE OF BEGINNING;

ALSO SAVE AND EXCEPT:

PART OF THE SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 36, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, DESCRIBED AS: BEGINNING AT THE SOUTHEAST CORNER OF THE SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 36; TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN; THENCE WEST 747 FEET; THENCE NORTH 478 FEET; THENCE EAST 153 FEET; THENCE NORTH TO THE NORTH LINE OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 36, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN; THENCE EAST 594 FEET; THENCE SOUTH TO THE PLACE OF BEGINNING, SITUATED IN VERMILION COUNTY, ILLINOIS

PIN 02-36-300-003

Lease 038
IL-HOO-038
Scott Willard and Melinda Willard

THE SOUTH HALF OF THE SOUTHWEST QUARTER OF SECTION 2, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 07-02-300-002

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Lease 039
IL-HOO-039
Skip Betka and Melissa Betka

THE SOUTH HALF OF THE SOUTHWEST QUARTER OF SECTION 33, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN SITUATED IN VERMILION COUNTY, ILLINOIS

PIN 02-33-300-002

Lease 040
IL-HOO-040
Jean E. Stewart , Trustee of the Stewart Family Trust

PARCEL 1

THE NORTH HALF OF THE NORTH HALF OF THE NORTHWEST QUARTER OF SECTION 12, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 07-12-100-003

PARCEL 2

THE SOUTH HALF OF THE NORTHWEST QUARTER OF SECTION 12, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT

BEGINNING ON THE SOUTH LINE OF SAID NORTHWEST QUARTER OF SAID SECTION 12, 925.4 FEET WEST OF THE CENTER OF SAID SECTION, THENCE WEST 438.6 FEET ON SAID SOUTH LINE, THENCE NORTH 89 DEGREES 15 MINUTES TO THE RIGHT 1346.7 FEET, THENCE 91 DEGREES 13 MINUTES TO THE RIGHT 431.5 FEET, THENCE SOUTHERLY 1343.5 FEET TO THE PLACE OF BEGINNING

ALSO SAVE AND EXCEPT

THAT PART CONVEYED TO THE STATE OF ILLINOIS BY RIGHT OF WAY AGREEMENT DATED OCTOBER 20, 1933 AND RECORDED JANUARY 25, 1934 IN DEED RECORD 399, PAGE 269, AS DOCUMENT NO. 366305, VERMILION COUNTY, ILLINOIS

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CONTAINING 66.6 ACRES, MORE OR LESS

PIN 07-12-100-001

Lease 041
IL-HOO-041
Mann Brothers, Inc.

PARCEL 1

NORTHWEST QUARTER OF SECTION 8, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-08-100-001

PARCEL 2

WEST HALF OF THE SOUTHWEST QUARTER OF SECTION 5, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-05-300-001

Lease 042
IL-HOO-042
Norma Jean Smith, Trustee of the Norma J. Smith Trust

PART OF THE SOUTHWEST QUARTER OF SECTION 3, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE 2ND P.M., IN VERMILION COUNTY, ILLINOIS, DESCRIBED AS FOLLOWS:

BEGINNING ON THE SOUTH LINE OF THE SOUTHWEST QUARTER OF SAID SECTION 3, A DISTANCE OF 627.0 FEET WEST OF THE SOUTHEAST CORNER OF SAID SOUTHWEST QUARTER; THENCE NORTH 90 DEGREES 00.0 MINUTES WEST ALONG SAID SOUTH LINE 1724.8 FEET; THENCE NORTHEASTERLY AND EASTERLY THE FOLLOWING COURSES ALONG THE CENTER LINE OF A DRAINAGE DITCH; NORTH 60 DEGREES 26.65 MINUTES EAST 12.5 FEET; THENCE NORTH 44 DEGREES 11.75 MINUTES EAST 20.8 FEET; THENCE NORTH 35 DEGREES 29.9 MINUTES EAST 106.6 FEET; THENCE NORTH 34 DEGREES 31.2 MINUTES EAST 205.5 FEET; THENCE NORTH 32 DEGREES 53.55 MINUTES EAST 327.4 FEET; THENCE NORTH 51 DEGREES 13.55 MINUTES EAST 57.7 FEET; THENCE NORTH 75 DEGREES 55.8 MINUTES EAST 59.2 FEET; THENCE NORTH 88 DEGREES 51.55 MINUTES EAST 54.6 FEET; THENCE SOUTH 67 DEGREES 49.2 MINUTES EAST 37.4 FEET; THENCE SOUTH 64 DEGREES 57.4

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MINUTES EAST 131.7 FEET; THENCE SOUTH 68 DEGREES 04.2 MINUTES EAST 51.2 FEET; THENCE SOUTH 69 DEGREES 50.4 MINUTES EAST 56.8 FEET; THENCE SOUTH 81 DEGREES 11.4 MINUTES EAST 166.5 FEET; THENCE SOUTH 88 DEGREES 14.15 MINUTES EAST 250.8 FEET; THENCE NORTH 81 DEGREES 09.35 MINUTES EAST 122.1 FEET; THENCE NORTH 76 DEGREES 06.35 MINUTES EAST 104.1 FEET; THENCE SOUTH 71 DEGREES 49.7 MINUTES EAST 41.2 FEET; THENCE SOUTH 53 DEGREES 44.3 MINUTES EAST 139.2 FEET; THENCE SOUTH 59 DEGREES 50.5 MINUTES EAST 70.2 FEET; AND THENCE SOUTH 69 DEGREES 33.6 MINUTES EAST 95.0 FEET; AND THENCE SOUTH 0 DEGREES 14.85 MINUTES EAST PARALLEL WITH THE EAST LINE OF SAID SOUTHWEST QUARTER 342.0 FEET TO THE PLACE OF BEGINNING; ENCOMPASSING 17.487 ACRES MORE OR LESS, SITUATED IN VERMILION COUNTY, ILLINOIS.

PIN 07-03-300-003

Lease 043
IL-HOO-043
Charles E. Maxwell

THE EAST HALF OF THE NORTHWEST QUARTER OF SECTION 4, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-04-100-002

Lease 044
IL-HOO-044
DocsFarms LLC

THE NORTHWEST QUARTER OF SECTION 9, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-09-100-001

Lease 045
IL-HOO-045
Donna J. Mason, Trustee of the Donna J. Mason Revocable Trust
John C. Mason, Jr., Trustee of the John C. Mason, Jr. Revocable Trust

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A PART OF THE NORTHEAST QUARTER OF SECTION 8, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT 1332 FEET SOUTH OF THE NORTHEAST CORNER OF THE NORTHEAST QUARTER OF SECTION 8, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN; THENCE WEST 2648 FEET, THENCE NORTH 444 FEET, THENCE EAST 2641 FEET, THENCE SOUTH 440 FEET TO THE PLACE OF BEGINNING, BEING THE SOUTH 26.88 ACRES OF THE NORTH ONE HALF OF THE NORTHEAST QUARTER OF SAID SECTION 8, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN: 08-08-200-002

Lease 046
INTENTIONALLY DELETED

Lease 047
IL-HOO-047
Charles E. Maxwell

PARCEL 1

THE EAST HALF OF THE SOUTHEAST QUARTER OF THE SOUTHEAST QUARTER AND THE EAST HALF OF THE WEST HALF OF THE SOUTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 23 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 03-31-400-004

PARCEL 2

THE EAST HALF OF THE SOUTHWEST QUARTER OF SECTION 32, TOWNSHIP 23 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 03-32-300-003

PARCEL 3

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THE EAST HALF OF THE WEST HALF OF THE SOUTHWEST QUARTER OF SECTION 32, TOWNSHIP 23 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 03-32-300-002

PARCEL 4

THE WEST HALF OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 32, TOWNSHIP 23 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 03-32-300-004

PARCEL 5

THE SOUTHEAST QUARTER OF THE NORTHWEST QUARTER OF SECTION 32, TOWNSHIP 23 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 03-32-100-005

PARCEL 6

THE EAST HALF OF THE SOUTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 32, TOWNSHIP 23 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 03-32-100-004

Lease 048
INTENTIONALLY DELETED

Lease 049
IL-HOO-049
Robert L. Alexander, Trustee of the Robert Alexander Revocable Living Trust

THE NORTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 11, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 07-11-300-001

UNOFFICIAL COPY

Lease 050
IL-HOO-050
Eugene Smith, Trustee of the Eugene Smith Trust
Norma J. Smith, Trustee of the Norma Smith Trust

PARCEL 1

THE NORTHWEST QUARTER OF SECTION 10, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT A PARCEL OF LAND CONVEYED TO GARY DEAN SMITH IN WARRANTY DEED DATED APRIL 7, 1975, RECORDED APRIL 8, 1975, IN BOOK 876, PAGE 383, AS DOCUMENT NO. 880163, OFFICIAL PUBLIC RECORDS, VERMILION COUNTY, ILLINOIS, AND MORE PARTICULARLY DESCRIBED AS FOLLOWS:

THE WEST 150 FEET OF EVEN WIDTH OFF THE EAST 1613.50 FEET OF EVEN WIDTH OF THE SOUTH 365 FEET OF EVEN WIDTH OF THE NORTHWEST QUARTER OF SECTION 10, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

AND SAVE AND EXCEPT A PARCEL OF LAND CONVEYED TO STEPHEN R. TORBET AND DIANA L. TORBET, IN WARRANTY DEED DATED JANUARY 3, 1977, RECORDED JANUARY 9, 1977, IN BOOK 912, PAGE 807, AS DOCUMENT NO. 906466, OFFICIAL PUBLIC RECORDS, VERMILION COUNTY, ILLINOIS, AND MORE PARTICULARLY DESCRIBED AS FOLLOWS:

THE WEST 325 FEET OF EVEN WIDTH OF THE EAST 1613.5 FEET OF EVEN WIDTH OF THE SOUTH 390 FEET OF THE NORTHWEST QUARTER OF SECTION 10, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SUBJECT TO THE RIGHT OF THE PUBLIC IN THE PUBLIC HIGHWAY KNOWN AS STATE AID ROUTE 14, ROW DEEDED TO VERMILION COUNTY, ILLINOIS, EXCLUDING THEREFROM THE WEST 150 FEET OF EVEN WIDTH OFF THE EAST 1613.50 FEET OF EVEN WIDTH OF THE SOUTH 365 FEET OF EVEN WIDTH OF THE NORTHWEST QUARTER OF SECTION 10, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT A PARCEL OF LAND CONVEYED TO STEPHEN R. TORBET AND DIANE L. TORBET IN EXECUTOR'S DEED DATED JANUARY 3, 1977, RECORDED IN BOOK 912, PAGE 808, OFFICIAL PUBLIC RECORDS, VERMILION COUNTY, ILLINOIS, AND MORE PARTICULARLY DESCRIBED AS FOLLOWS:

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THE WEST 150 FEET OF EVEN WIDTH OFF THE EAST 1613.50 FEET OF EVEN WIDTH OF THE SOUTH 365 FEET OF EVEN WIDTH OF THE NORTHWEST QUARTER OF SECTION 10, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 07-10-100-001

PARCEL 2

THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 9, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT A PARCEL OF LAND CONVEYED TO THE STATE OF ILLINOIS, DEPARTMENT OF TRANSPORTATION, IN TRUSTEE'S DEED RECORDED MAY 18, 2001, AS DOCUMENT NO. 01-0005400, OFFICIAL PUBLIC RECORDS, VERMILION COUNTY, ILLINOIS, AND MORE PARTICULARLY DESCRIBED AS FOLLOWS:

PART OF THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 9, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHEAST CORNER OF THE SOUTHEAST QUARTER OF SAID SECTION 9, THENCE NORTH 89 DEGREES 58 MINUTES 28 SECONDS WEST (BEARINGS ARE ASSUMED) 405.704 METES (1,331.05 FEET) ALONG THE NORTH LINE OF THE NORTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SAID SECTION 9, TO THE NORTHEAST CORNER OF THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SAID SECTION 9, SAID POINT BEING THE POINT OF BEGINNING, THENCE SOUTH 00 DEGREES 09 MINUTES 58 SECONDS WEST 19.216 METERS (63.04 FEET) ALONG THE EAST LINE OF THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SAID SECTION 9, THENCE SOUTH 90 DEGREES 00 MINUTES 00 SECONDS WEST 26.130 METERS (85.73 FEET), SAID LINE BEING PARALLEL WITH AND 19.507 METERS (64.00 FEET) SOUTHERLY OF THE CENTERLINE OF FAS 496 (CH 14), THENCE NORTH 00 DEGREES 00 MINUTES 00 SECONDS EAST 19.228 METERS (63.08 FEET), SAID LINE BEING PERPENDICULAR TO THE CENTERLINE OF FAS 496, TO THE NORTH LINE OF THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SAID SECTION 9, THENCE SOUTH 89 DEGREES 58 MINUTES 28 SECONDS EAST 26.186 METERS (85.91 FEET) ALONG SAID NORTH LINE, TO THE POINT OF BEGINNING, CONTAINING 0.0503 OF A HECTARE (0.124 OF AN ACRE), MORE OR LESS, OF WHICH 0.0391 OF A HECTARE (0.097 OF AN ACRE), MORE OR LESS, IS IN EXISTING PUBLIC RIGHT OF WAY

PIN 07-09-400-006

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Lease 051
IL-HOO-051
Raymond D. Willard and Dorothy A. Willard

THE EAST HALF OF SECTION 26, TOWNSHIP 23 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 02-26-200-001

Lease 052
IL-HOO-052
James P. Hatfield and Caryn H. Hatfield

ALL THAT PART OF THE WEST HALF OF LOT 2 OF THE NORTHWEST QUARTER OF SECTION 5, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE 2ND P.M., VERMILION COUNTY, ILLINOIS, DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHWEST CORNER OF SAID SECTION 5; THENCE SOUTH 62 RODS AND 3 FEET; THENCE EAST 79 RODS; THENCE NORTH 62 RODS AND 3 FEET; THENCE WEST 79 RODS TO THE PLACE OF BEGINNING, SITUATED IN VERMILION COUNTY, ILLINOIS

PIN 08-05-100-001

Lease 053
IL-HOO-053
John C. Mason, Trustee of the John C. Mason Trust

THE NORTH HALF OF THE NORTHEAST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 4, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE 2ND P.M., VERMILION COUNTY, ILLINOIS, CONTAINING 19.86 ACRES MORE OR LESS

SOUTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 4, AND THE NORTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 4, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE 2ND P.M., CONTAINING 80 ACRES MORE OR LESS, VERMILION COUNTY, ILLINOIS

PIN 08-04-300-001

Lease 054
IL-HOO-054
Jean E. Stewart, Trustee of the Stewart Family Trust

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THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 11, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, CONTAINING 40 ACRES, MORE OR LESS

PIN 07-11-300-003

Lease 055
IL-HOO-055
Millie A. Justice and James P. Hatfield, Co-Trustees of the Richard L. Hatfield Irrevocable Living Trust Agreement
Millie Justice
James P. Hatfield

THE SOUTH HALF OF THE NORTHEAST QUARTER OF SECTION 9, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT:

COMMENCING AT THE SOUTHEAST CORNER OF THE NORTHEAST QUARTER OF SAID SECTION 9; THENCE NORTH 89 DEGREES 58 MINUTES 28 SECONDS WEST (BEARINGS ARE ASSUMED) 394.890 METERS (1,295.57 FEET) ALONG THE SOUTH LINE OF THE NORTHEAST QUARTER OF SAID SECTION 9, TO THE POINT OF BEGINNING; THENCE CONTINUING NORTH 89 DEGREES 58 MINUTES 28 SECONDS WEST ALONG SAID SOUTH LINE, 54.000 METERS (177.17 FEET); THENCE NORTH 00 DEGREES 00 MINUTES 00 SECONDS EAST 17.341 METERS (56.89 FEET); SAID LINE BEING PERPENDICULAR TO THE CENTERLINE OF FAS 496 (CH 14); THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS EAST 12.000 METERS (39.37 FEET); ALONG A LINE BEING PARALLEL WITH AND 17.069 METERS (56.00 FEET) NORTHERLY OF THE CENTERLINE OF FAS 496; THENCE NORTH 69 DEGREES 54 MINUTES 45 SECONDS EAST 10.648 METERS (34.93 FEET); THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS EAST 32.000 METERS (104.99 FEET) ALONG A LINE BEING PARALLEL WITH AND 20.726 METERS (68.00 FEET) NORTHERLY OF THE CENTERLINE OF FAS 496; THENCE SOUTH 00 DEGREES 00 MINUTES 00 SECONDS WEST 21.022 METERS (68.97 FEET), TO THE POINT OF BEGINNING, CONTAINING 0.1072 OF A HECTARE (0.265 OF AN ACRE), MORE OR LESS OF WHICH 0.0838 OF A HECTARE (0.207 OF AN ACRE), MORE OR LESS, IS IN EXISTING PUBLIC RIGHT OF WAY

PIN 07-09-200-003

THE SOUTHEAST QUARTER OF THE NORTHWEST QUARTER OF SECTION 9, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, CONSISTING OF 39 ACRES, MORE OR LESS

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PIN 07-09-100-003

Lease 056
IL-HOO-056

Intentionally not included at this time

Fee Parcel 057
IL-HOO-057
Hoopeston Wind, LLC

SUBSTATION PARCEL

A PART OF THE NORTHWEST QUARTER, TOGETHER WITH A PART OF THE NORTHEAST QUARTER OF SECTION 3, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, MORE PARTICULARLY DESCRIBED AS FOLLOWS: COMMENCING AT THE SOUTHEAST CORNER OF SAID NORTHWEST QUARTER OF SECTION 3 AND RUNNING; THENCE NORTH 02°39'14" WEST, ALONG THE EAST LINE OF SAID NORTHWEST QUARTER BEING ALSO THE WEST LINE OF SAID NORTHEAST QUARTER, 466.96 FEET, TO THE POINT OF BEGINNING; THENCE SOUTH 89°16'45" WEST, PARALLEL WITH THE SOUTH LINE OF SAID NORTHWEST QUARTER, 466.96 FEET; THENCE NORTH 02°39'14" WEST, PARALLEL WITH THE EAST LINE OF SAID NORTHWEST QUARTER, 419.19 FEET; THENCE NORTH 89°14'49" EAST, PARALLEL WITH SAID SOUTH LINE OF THE NORTHWEST QUARTER, 466.96 FEET, TO A POINT ON SAID EAST LINE OF THE NORTHWEST QUARTER; THENCE NORTH 02°39'14" WEST, ALONG SAID EAST LINE, 332.81 FEET, TO THE NORTHWEST CORNER OF THE SOUTH HALF OF SAID NORTHEAST QUARTER OF SECTION 3; THENCE NORTH 89°03'47" EAST, ALONG THE NORTH LINE OF SAID SOUTH HALF, 30.01 FEET; THENCE SOUTH 02°39'14 WEST, PARALLEL WITH THE WEST LINE OF SAID NORTHEAST QUARTER, 752.39 FEET; AND THENCE SOUTH 89°16'45" WEST, 30.01 FEET, TO THE POINT OF BEGINNING

CONTAINING 218265.11 SQUARE FEET OR 5.01 ACRES OF LAND MORE OR LESS

PIN PART OF 08-03-100-001 AND PART OF 08-03-200-003

Lease 058
IL-HOO-058
Forest W. Peters, Jr. and Mary E. Peters

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THE NORTH HALF OF THE SOUTHWEST QUARTER OF SECTION 33, TOWNSHIP 23 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 03-33-300-001

Lease 059
IL-HOO-059
Jean E. Stewart, Trustee of the Stewart Family Trust

PARCEL 1

ALL THAT PART OF THE EAST HALF OF SECTION 15, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, LYING NORTH OF THE CENTER LINE OF DRAINAGE DITCH RUNNING ACROSS SAID LAND, SAID TRACT BEING DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHEAST CORNER OF SAID SECTION 15, THENCE SOUTH ALONG THE EAST LINE OF SAID SECTION 2264.65 FEET, THENCE WEST 45 FEET TO THE WEST RIGHT OF WAY LINE OF THE EAST LYNN-POTOMAC ROAD AND THE CENTER OF SAID DRAINAGE DITCH, THENCE IN A SOUTHWESTERLY DIRECTION FOLLOWING THE CENTER LINE OF SAID DRAINAGE DITCH TO A POINT WHERE IT INTERSECTS THE WEST LINE OF THE EAST HALF OF SAID SECTION 15; SAID CENTER LINE OF SAID DITCH BEING MORE CLEARLY DEFINED BY THE MEANDER LINE AS FOLLOWS; FROM THE WEST LINE OF SAID ROAD AND CENTER LINE OF SAID DITCH ABOVE MENTIONED MEASURE THENCE SOUTH 78 DEGREES 55 MINUTES 24 SECONDS WEST 977.15 FEET, THENCE SOUTH 01 DEGREES 28 MINUTES 07 SECONDS WEST 1211.84 FEET; THENCE SOUTH 33 DEGREES 00 MINUTES 25 SECONDS WEST 364.48 FEET, THENCE SOUTH 88 DEGREES 28 MINUTES 29 SECONDS WEST 644.95 FEET, THENCE NORTH 63 DEGREES 43 MINUTES 58 SECONDS WEST 783.94 FEET, THENCE SOUTH 83 DEGREES 34 MINUTES 53 SECONDS WEST 49.2 FEET TO THE WEST LINE OF THE EAST HALF OF SAID SECTION 15; THENCE NORTH 00 DEGREES 09 MINUTES WEST 3660.67 FEET TO THE NORTHWEST CORNER OF THE NORTHEAST QUARTER OF SAID SECTION 15; THENCE SOUTH 89 DEGREES 39 MINUTES 37 SECONDS EAST 2639.8 FEET TO THE PLACE OF BEGINNING; EXCEPT THAT PART CONVEYED TO STATE OF ILLINOIS FOR HIGHWAY PURPOSES AS SHOWN BY DEED RECORDED IN DEED RECORD 389 PAGE 60 OF RECORDS OF VERMILION COUNTY, ILLINOIS, ALSO SUBJECT TO PUBLIC HIGHWAYS, IN VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT A PARCEL OF LAND CONVEYED TO THE STATE OF ILLINOIS, DEPARTMENT OF TRANSPORTATION IN WARRANTY DEED RECORDED MARCH 20, 1990, AS INSTRUMENT NO. 90-2077, AND MORE PARTICULARLY DESCRIBED AS:

Thomas O'Shaughnessy Vermilion County Recorder Doc # 14-09577 Page 45 OF 71

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BEGINNING AT THE INTERSECTION OF THE WEST RIGHT OF WAY LINE OF FAS ROUTE 331 (EAST LYNN-POTOMAC ROAD) AND THE CENTER OF SAID DRAINAGE DITCH; THENCE SOUTHWESTERLY ALONG SAID DRAINAGE DITCH CENTERLINE FOR 106.34 FEET; THENCE NORTH 1 DEGREE 10 MINUTES 50 SECONDS WEST FOR 29.20 FEET ALONG A LINE LYING 156 FEET WEST OF AND PARALLEL WITH THE PROPOSED CENTERLINE OF FAS ROUTE 331; THENCE NORTH 51 DEGREES 56 MINUTES 58 SECONDS EAST FOR 100.00 FEET; THENCE NORTH 1 DEGREE 10 MINUTES 50 SECONDS WEST FOR 1,600.00 FEET; THENCE NORTH 88 DEGREES 49 MINUTES 10 SECONDS EAST FOR 25.00 FEET; THENCE SOUTH 1 DEGREE 10 MINUTES 50 SECONDS EAST FOR 1,672.40 FEET ALONG A LINE LYING 45 FEET WEST OF AND PARALLEL WITH THE EXISTING CENTERLINE OF FAS ROUTE 331 TO THE PLACE OF BEGINNING, CONTAINING 1.058 ACRES, MORE OR LESS

PIN 07-15-200-001
PIN 07-15-400-001

PARCEL 2

THE NORTHWEST QUARTER OF SECTION 14, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

SAVE AND EXCEPT A PARCEL OF LAND CONVEYED TO THE STATE OF ILLINOIS, DEPARTMENT OF TRANSPORTATION, IN TRUSTEE'S DEED DOCUMENT 90-2827, OFFICIAL PUBLIC RECORDS, VERMILION COUNTY, ILLINOIS, AND DESCRIBED AS FOLLOWS:

SAID SAVE AND EXCEPT PARCEL IS MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE INTERSECTION OF THE EXISTING EAST RIGHT OF WAY LINE OF FAS ROUTE 331 (SA ROUTE 10) AND THE NORTH LINE OF THE ABOVE DESCRIBED PROPERTY; THENCE NORTH 89 DEGREES 33 MINUTES 23 SECONDS EAST FOR 15.00 FEET ALONG SAID NORTH LINE; THENCE SOUTH 1 DEGREE 10 MINUTES 50 SECONDS EAST FOR 365.00 FEET ALONG A LINE LYING 39 FEET EAST OF AND PARALLEL WITH THE PROPOSED CENTERLINE OF FAS ROUTE 331; THENCE SOUTH 89 DEGREES 33 MINUTES 23 SECONDS WEST FOR 15.00 FEET ALONG THE SOUTH LINE OF THE ABOVE DESCRIBED PROPERTY; THENCE NORTH 1 DEGREE 10 MINUTES 50 SECONDS WEST FOR 365 FEET ALONG THE EXISTING EAST RIGHT OF WAY OF FAS ROUTE 331 CONTAINING 0.126 OF AN ACRE, MORE OR LESS

PINS 07-14-100-01 (NW ¼ OF THE NW ¼)

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07-14-100-002 (NE ¼ OF THE NW ¼)
07-14-100-003 (S ½ OF THE NW ¼)

Lease 068
IL-HOO-068
Barnes, Barnes & Voight, LLC

PARCEL 1

THE EAST HALF OF THE SOUTHWEST QUARTER OF SECTION 7, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-07-300-002

PARCEL 2

THE WEST HALF OF THE SOUTHEAST QUARTER AND THE NORTH 30 ACRES OF THE EAST HALF OF THE SOUTHEAST QUARTER OF SECTION 7, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS

PIN 08-07-400-001

Lease 094
IL-HOO-094
William M. Blair, Jr., Trustee under the Blair Siblings Trust dated May 20, 2010

THE SURFACE ONLY OF A TRACT OF LAND LYING IN AND BEING A PART OF THE NORTH THREE QUARTERS OF THE NORTHEAST QUARTER OF SECTION 3, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE 2ND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, SAID TRACT OF LAND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING ON THE NORTHEAST CORNER OF SAID NORTH THREE QUARTERS OF THE NORTHEAST QUARTER; THENCE SOUTH ALONG THE EAST LINE OF SAID NORTHEAST QUARTER A DISTANCE OF 357.14 FEET TO THE POINT OF BEGINNING; THENCE WEST, PARALLEL WITH THE NORTH LINE OF SAID NORTHEAST QUARTER A DISTANCE OF 450 FEET; THENCE SOUTH, PARALLEL WITH THE EAST LINE OF SAID NORTHEAST QUARTER A DISTANCE OF 390 FEET; THENCE EAST, PARALLEL WITH THE NORTH LINE OF SAID NORTHEAST

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QUARTER A DISTANCE OF 450 FEET; THENCE NORTH ALONG THE EAST LINE OF SAID NORTHEAST QUARTER A DISTANCE OF 390 FEET TO THE POINT OF BEGINNING, CONTAINING APPROXIMATELY FOUR (4) ACRES.

PIN: PART OF 07-03-200-001

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SCHEDULE B TO
SECOND AMENDMENT TO
CONSTRUCTION MORTGAGE ET AL.

Legal Description of Fee Property

Fee Parcel 057
IL-HOO-057
Hoopeston Wind, LLC

SUBSTATION PARCEL

A PART OF THE NORTHWEST QUARTER, TOGETHER WITH A PART OF THE NORTHEAST QUARTER OF SECTION 3, TOWNSHIP 22 NORTH, RANGE 12 WEST OF THE SECOND PRINCIPAL MERIDIAN, VERMILION COUNTY, ILLINOIS, MORE PARTICULARLY DESCRIBED AS FOLLOWS: COMMENCING AT THE SOUTHEAST CORNER OF SAID NORTHWEST QUARTER OF SECTION 3 AND RUNNING; THENCE NORTH 02°39'14" WEST, ALONG THE EAST LINE OF SAID NORTHWEST QUARTER BEING ALSO THE WEST LINE OF SAID NORTHEAST QUARTER, 466.96 FEET, TO THE POINT OF BEGINNING; THENCE SOUTH 89°16'45" WEST, PARALLEL WITH THE SOUTH LINE OF SAID NORTHWEST QUARTER, 466.96 FEET; THENCE NORTH 02°39'14" WEST, PARALLEL WITH THE EAST LINE OF SAID NORTHWEST QUARTER, 419.19 FEET; THENCE NORTH 89°14'49" EAST, PARALLEL WITH SAID SOUTH LINE OF THE NORTHWEST QUARTER, 466.96 FEET, TO A POINT ON SAID EAST LINE OF THE NORTHWEST QUARTER; THENCE NORTH 02°39'14" WEST, ALONG SAID EAST LINE, 332.81 FEET, TO THE NORTHWEST CORNER OF THE SOUTH HALF OF SAID NORTHEAST QUARTER OF SECTION 3; THENCE NORTH 89°03'47" EAST, ALONG THE NORTH LINE OF SAID SOUTH HALF, 30.01 FEET; THENCE SOUTH 02°39'14 WEST, PARALLEL WITH THE WEST LINE OF SAID NORTHEAST QUARTER, 752.39 FEET; AND THENCE SOUTH 89°16'45" WEST, 30.01 FEET, TO THE POINT OF BEGINNING

CONTAINING 218265.11 SQUARE FEET OR 5.01 ACRES OF LAND MORE OR LESS

PIN PART OF 08-03-100-001 AND PART OF 08-03-200-003

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Fee Parcel 089
IL-HOO-089
Hoopeston Wind, LLC

THE PREMISES CONSISTS OF ALL OF THE FOLLOWING LAND, SITUATED IN THE COUNTY OF VERMILION, IN THE STATE OF ILLINOIS:

A PART OF THE SOUTH HALF (S ½) OF SECTION 1, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE 2ND P.M. DESCRIBED AS FOLLOWS, TO-WIT:

BEGINNING AT THE SOUTHEAST CORNER OF THE SOUTH HALF OF SAID SECTION 1, THENCE NORTH ON THE EAST SECTION LINE A DISTANCE OF 590 FEET FOR A PLACE OF BEGINNING, THENCE CONTINUING NORTH ON THE EAST SECTION LINE A DISTANCE OF 396 FEET, THENCE WEST PARALLEL WITH THE SOUTH SECTION LINE A DISTANCE OF 570 FEET, THENCE SOUTH PARALLEL WITH THE EAST SECTION LINE A DISTANCE OF 396 FEET, THENCE EAST PARALLEL WITH THE SOUTH SECTION LINE A DISTANCE OF 570 FEET TO THE PLACE OF BEGINNING, CONTAINING 5.18 ACRES MORE OR LESS, SITUATED IN VERMILION COUNTY, ILLINOIS.

TAX PARCEL REFERENCE: 07-01-400-004 (5.18 ACRES)

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SCHEDULE C TO
SECOND AMENDMENT TO
CONSTRUCTION MORTGAGE ET AL.

Existing Leases

Lease 001
IL-HOO-001
Michael A. von Neumann, Frederic R. von Neumann, Erik R. von Neumann and Heirs of Frances Wyers

Unrecorded Wind Energy Lease and Agreement by and between Alice Von Neumann and Frances Wyers and Hoopeston Wind LLC, a Delaware limited liability company, dated November 12, 2009, as evidenced by that certain Memorandum of Lease dated November 12, 2009, recorded April 12, 2012, as Document No. 12-03201, as amended by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, by and between Michael A. von Neumann, Frederic R. von Neumann, Erik R. von Neumann and David Weber and Hoopeston Wind, LLC, a Delaware limited liability company, dated March 20, 2014, recorded April 29, 2014, as Document No. 14-02890, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 18, 2014

Lease 002
IL-HOO-002
William A. Marshall, Jr., Life Estate
Amy Reetz, an undivided ½ interest, Remainderman
Heirs of Marcia Hill, an undivided ½ interest

Unrecorded Wind Energy Lease and Agreement by and between Amy C. Reetz and Hoopeston Wind LLC, a Delaware limited liability company, dated April 26, 2009, as evidenced by that certain Memorandum of Lease, dated April 26, 2009, recorded April 12, 2010, as Document No. 12-03188, , as amended and ratified by Kim Kessen, Executor of the Estate of Marcia Hill, William A. Marshall and Amy Reetz, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, dated March 15, 2014, recorded March 26, 2014, as Document No. 14-01857, Official Public Records, Vermilion County, Illinois, , and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 15, 2014

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Lease 003
IL-HOO-003
Dewain J. Moore, Trustee of the Harold and Ardith A Orr Trust

Unrecorded Wind Energy Lease and Agreement by and between Ardith A. Orr, Trustee of the Ardith A Orr Trust, and Hoopeston Wind LLC, dated June 10, 2008, as evidenced by that certain Memorandum of Lease, dated June 10, 2008, recorded April 21, 2009, as Document No. 09-03486, as amended and ratified by Dewain J. Moore, as Trustee of the Harold and Ardith A. Orr Trust, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, dated June 13, 2013, recorded August 30, 2013, as Document No. 13-07665, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 28, 2014

Lease 004
IL-HOO-004
MWG Holdings, LLC, an Illinois limited liability company

Unrecorded Wind Energy Lease and Agreement by and between Benck Family Partnership "B" and Hoopeston Wind, LLC, a Delaware limited liability company, dated January 6, 2010, as evidenced by that certain Memorandum of Lease, dated January 6, 2010, recorded April 12, 2012, as Document No. 12-03200, as amended and ratified by MWG Holdings, LLC, an Illinois limited liability company, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, , dated February 12, 2014, recorded March 6, 2014, as Document No. 14-01299, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 24, 2014

Lease 005
IL-HOO-005
Bruce E. Frank and Bonita J. Frank, *joint tenants*

Unrecorded Wind Energy Lease and Agreement by and between Bruce E. & Bonita J. Frank and Hoopeston Wind LLC, a Delaware limited liability company, dated June 27, 2008, as evidenced by that certain Memorandum of Lease dated June 27, 2008, recorded April 21, 2009, as Document No. 09-03492, as amended by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Ratification, dated February 19, 2014, recorded March 13, 2014, as Document No. 14-01503, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 27, 2014

Lease 006
IL-HOO-006

Thomas O'Shaughnessy Vermilion County Recorder Doc # 14-09577 Page 52 OF 71

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Bush LLC (Parcels 1-5)
Hoopeston Wind, LLC (Parcel 6)

Unrecorded Wind Energy Lease and Agreement by and between Bush, L.L.C., a Washington limited liability company, and Hoopeston Wind LLC, a Delaware limited liability company, dated October 14, 2010, as evidenced by that certain Memorandum of Lease, dated October 14, 2010, recorded June 10, 2013, as Document No. 13-04895, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded First Amendment to Wind Energy Lease and Agreement dated December 27, 2013, and as amended by that certain Second Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, dated March 14, 2014, recorded March 24, 2014, as Document No. 14-01779, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 14, 2014, and as amended by that certain Partial Termination of Wind Energy Lease and Agreement and Memorandum, dated May 22, 2014, recorded May 27, 2014, as Document No. 14-03685, Official Public Records, Vermilion County, Illinois

Lease 007
IL-HOO-007
Charles Maxwell

Unrecorded Wind Energy Lease and Agreement by and between Chuck Maxwell and Hoopeston Wind LLC, a Delaware limited liability company, dated June 30, 2008, as evidenced by that certain Memorandum of Lease, dated June 30, 2008, recorded April 21, 2009, as Document No. 09-03484, as amended by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum and Ratification, dated February 19, 2014, recorded March 6, 2014, as Document No. 14-01300, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 28, 2014

Lease 008
IL-HOO-008
Curtis Orr (Parcels 1-5)
Randie Orr and Tamara Orr (Parcel 6)

Unrecorded Wind Energy Lease and Agreement dated May 30, 2008, by and between Curtis L. Orr and Hoopeston Wind LLC, a Delaware limited liability company, as evidenced by that certain Memorandum of Lease dated May 30, 2008, recorded April 21, 2009, as Document No. 09-03497, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 4, 2014, and as amended and ratified by Curtis L. Orr; and Randie Orr and Tamara Orr, husband and wife, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, dated March 17, 2014, recorded March 24, 2014, as Document No. 14-01785, Official Public Records, Vermilion County, Illinois

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Lease 009
IL-HOO-009
Debbie Maxwell

Unrecorded Wind Energy Lease and Agreement by and between Debbie Maxwell and Hoopeston Wind LLC, a Delaware limited liability company, dated April 27, 2010, as evidenced by that certain Memorandum of Lease, dated April 27, 2010, recorded April 12, 2012, as Document No. 12-03187, as amended by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum and Ratification, dated February 19, 2014, recorded March 6, 2014, as Document No. 14-01301, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 28, 2014

Lease 010
IL-HOO-010
Derick Stewart

Unrecorded Wind Energy Lease and Agreement by and between Derick Stewart and Hoopeston Wind LLC, a Delaware limited liability company, dated June 8, 2008, as evidenced by that certain Memorandum of Lease dated June 8, 2008, recorded April 21, 2009, as Document No. 09-03485, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 26, 2014

Lease 011
IL-HOO-011
Dewain J. Moore, Trustee of the Dewain J. Moore Trust

Unrecorded Wind Energy Lease and Agreement, by and between Dewain Moore Trust and Hoopeston Wind LLC, a Delaware limited liability company, dated May 29, 2008, , as evidenced by that certain Memorandum of Lease, dated May 29, 2008, recorded April 21, 2009, as Document No. 09-03489, as amended and ratified by Dewain J. Moore, Trustee of the Dewain J. Moore Trust u/a/d June 3, 1997, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum and Ratification, dated February 28, 2014, recorded March 13, 2014, as Document No. 14-01504, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 28, 2014

Lease 012
IL-HOO-012
Russell T. Williams, Trustee of the Russell Williams Trust and of the Maxine Williams Trust

UNOFFICIAL COPY

Unrecorded Wind Energy Lease and Agreement, by and between Edith Maxine Williams and Hoopeston Wind LLC, a Delaware Limited liability company, dated October 8, 2009, as evidenced by that certain Memorandum of Lease, dated March 4, 2014, recorded March 13, 2014, as Document No. 14-01505, Official Public Records, Vermilion County, Illinois, as amended and ratified by Russell T. Williams, Successor Trustee of the Russell Williams Trust u/a/d May 16, 1997, and Successor Trustee of the Maxine Williams Trust u/a/d May 16, 1997, by that certain unrecorded First Amendment to Wind Energy Lease and Agreement, Joinder and Ratification, dated March 4, 2014, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 4, 2014

Lease 013
IL-HOO-013
Betty Jo Hartter
Bonita J. Frank

Unrecorded Wind Energy Lease and Agreement by and between Bonita J. Frank and Beverly Hartter and Hoopeston Wind LLC, a Delaware limited liability company, dated July 4, 2008, as evidenced by that certain Memorandum of Lease dated July 4, 2008, recorded April 21, 2009, as Document No. 09-03496, as amended and ratified by Bonita Joy Frank and Beverly Jo Hartter, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Ratification, dated July 3, 2013, recorded August 30, 2013, as Document No. 13-07666, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 13, 2014

Lease 014
IL-HOO-014
James P. Hatfield & Caryn M. Hatfield

Unrecorded Wind Energy Lease and Agreement dated May 29, 2008, by and between James P. Hatfield & Caryn M. Hatfield, and Hoopeston Wind LLC, a Delaware limited liability company, as evidenced by that certain Memorandum of Lease dated May 29, 2008, recorded April 21, 2009, as Document No. 09-03479, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 10, 2014

Lease 015
IL-HOO-015
Howard W. Robinson, Trustee of the Trust #99-1 (Parcel 1)
Howard W. Robinson and Carolyn Robinson, Life Estates
Ann R. Phillips, Carol C. Edmund, and Elizabeth Jane Jacobs, Trustee of the Elizabeth Jane Jacobs Trust, Remaindermen

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Unrecorded Wind Energy Lease and Agreement dated June 27, 2008, by and between Howard W. Robinson and Hoopeston Wind LLC, a Delaware limited liability company, as evidenced by that certain Memorandum of Lease dated June 27, 2008, recorded April 21, 2009, as Document No. 09-03476, as amended and ratified by Howard W. Robinson, Trustee of Trust #99-1 dated January 2, 1999; Howard W. Robinson and Carolyn Robinson, life estate tenants; Ann R. Phillips, Carol C. Edmund, and Elizabeth Jane Jacobs, Trustee of the Elizabeth Jane Jacobs Trust dated January 24, 1995, remaindermen, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, dated April 30, 2014, recorded May 6, 2014, as Document No. 14-03115, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 17, 2014

Lease 016
IL-HOO-016
Jean E. Stewart and Cheryl D. Stewart, Co-Trustees of the Jean and Cheryl Stewart Living Trust

Unrecorded Wind Energy Lease and Agreement dated July 7, 2008, by and between Jean and Cheryl Stewart Trust and Hoopeston Wind LLC, a Delaware limited liability company, as evidenced by that certain Memorandum of Lease dated July 7, 2008, recorded April 21, 2009, as Document No. 09-03495, as amended and ratified by Jean E. Stewart and Cheryl D. Stewart, Co-Trustees of the Jean and Cheryl Stewart Living Trust dated September 8, 2003, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum and Joinder and Ratification, dated July 10, 2013, recorded August 30, 2013, as Document No. 13-07667, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 25, 2014

Lease 017
IL-HOO-017
Forest Peters, Jr., Mary E. Peters and Joe A. Peters

Unrecorded Wind Energy Lease and Agreement dated May 29, 2008, by and between Forest W. Peters, Jr., Mary E. Peters and Joe A. Peters and Hoopeston Wind LLC, a Delaware limited liability company, as evidenced by that certain Memorandum of Lease dated May 29, 2008, recorded April 21, 2009, as Document No. 09-03480, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 26, 2014

Lease 018
IL-HOO-018
Larry Betka and Carol Betka

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Unrecorded Wind Energy Lease and Agreement by and between Larry Betka and Carol Betka and Hoopeston Wind LLC, a Delaware limited liability company, dated May 29, 2008, as evidenced by that certain Memorandum of Lease dated May 29, 2008, recorded April 21, 2009, as Document No. 09-03478, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 4, 2014

Lease 019
IL-HOO-019
Joyce E. Williams

Unrecorded Wind Energy Lease and Agreement, by and between Larry Williams and Hoopeston Wind LLC, a Delaware limited liability company, dated July 21, 2008 as evidenced by that certain Memorandum of Lease dated July 21, 2008, recorded April 21, 2009, as Document No. 09-03494, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 5, 2014

Lease 020
IL-HOO-020
LaVerne A. O'Hare, Life Estate
Debra O. Short, Remainderman

Unrecorded Wind Energy Lease and Agreement dated July 1, 2008 by and between LaVerne A. O'Hare and Hoopeston Wind LLC, a Delaware limited liability company, as evidenced by that certain Memorandum of Lease dated July 1, 2008, recorded April 21, 2009, as Document No. 09-03483, as amended and ratified by Laverne A. O-Hare, individually and as life estate tenant, and Debra O. Short, remainderman, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum and Joinder and Ratification, dated July 12, 2013, recorded August 30, 2013, as Document No. 13-07668, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 25, 2014

Lease 021
IL-HOO-021
1st Source Bank, Successor Trustee of the Alice P. Hammerton Living Trust

Unrecorded Wind Energy Lease and Agreement by and between Lloyd Hammerton and Hoopeston Wind LLC, a Delaware limited liability company, dated June 30, 2008, as evidenced by that certain Memorandum of Lease, dated June 30, 2008, recorded April 21, 2009, as Document No. 09-03491 as amended and ratified by and between 1st Source Bank, Successor Trustee of the Alice P. Hammerton Living Trust, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, dated June 27, 2013, recorded August 30, 2013, as Document No. 13-07669,

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Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 6, 2014

Lease 022
IL-HOO-022
Lois Lee Petersen

Unrecorded Wind Energy Lease and Agreement by and between Lois L. Petersen and Hoopeston Wind LLC, a Delaware limited liability company, dated November 22, 2008, as evidenced by that certain Memorandum of Lease, dated November 22, 2008, recorded April 21, 2009, as Document No. 09-03490, as amended and ratified by Lois Lee Petersen a/k/a Lois L. Petersen, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum and Ratification, dated November 20, 2013, recorded January 27, 2014, as Document No. 14-00489, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 3, 2014

Lease 023
IL-HOO-023
Lucinda M. Barnes, Trustee of the Lucinda M. Barnes Trust

Unrecorded Wind Energy Lease and Agreement by and between Lucinda M. Barnes and Hoopeston Wind LLC, a Delaware limited liability company, dated August 12, 2008, as evidenced by that certain Memorandum of Lease dated August 12, 2008, recorded April 12, 2012, as Document No. 12-03204, as amended and ratified by Lucinda M. Barnes, Trustee of the Lucinda M. Barnes Trust Agreement dated December 20, 1995, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, dated August 5, 2013, recorded August 30, 2013, as Document No. 13-07670, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 24, 2014

Lease 024
IL-HOO-024
Lynn E. Green and John D. Green, Life Estates
Paula L. Green, Kristi L. Maged, and Michael John Green, Remaindermen

Unrecorded Wind Energy Lease and Agreement by and between Lynn E. Green and Hoopeston Wind LLC, a Delaware limited liability company, dated August 2, 2008, as evidenced by that certain Memorandum of Lease dated August 2, 2008, recorded April 21, 2009, as Document No. 09-03487, as amended and ratified by Lynn E. Green and John D. Green, as life estate tenants, and Paula L. Green, Kristi L. Maged, and Michael John Green, as remaindermen, by that certain Joinder and Ratification of Wind Energy Lease and Agreement and Memorandum, dated March 4, 2014, recorded March 13, 2014,

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as Document No. 14-01506, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 4, 2014

Lease 025
IL-HOO-025
Mann Brothers Inc.

Unrecorded Wind Energy Lease and Agreement by and between Mann Brothers, Inc. and Hoopeston Wind LLC, a Delaware limited liability company, dated September 2, 2008, as evidenced by that certain Memorandum of Lease dated September 2, 2008, recorded April 21, 2009, as Document No. 09-03477, as amended by that certain First Amendment to Wind Energy Lease and Agreement and Memorandum of Lease, dated December 18, 2013, recorded January 27, 2014, as Document No. 14-00490, as amended by that certain Second Amendment to Wind Energy Lease and Agreement and Memorandum of Lease, dated February 3, 2014, recorded February 27, 2014, as Document No. 14-01121, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 4, 2014

Lease 026
IL-HOO-026
Marilyn J. Moore, Trustee of Marilyn J. Moore Trust

Unrecorded Wind Energy Lease and Agreement by and between Marilyn J. Moore Trust and Hoopeston Wind LLC, a Delaware limited liability company, dated May 29, 2008, as evidenced by that certain Memorandum of Lease dated May 29, 2008, recorded April 21, 2009, as Document No. 09-03493, as amended and ratified by Marilyn J. Moore, Trustee of the Marilyn J. Moore Trust, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, dated February 26, 2014, recorded March 13, 2014, as Document No. 14-01507, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 28, 2014

Lease 027
IL-HOO-027
Lawrence R. Alt and James P. Alt, Co-Trustees of the Brian A. Alt Trust (Parcel 1)
Mark E. Alt and Kristin L. Alt, Trustees of the Mark E. Alt and Kristin L. Alt Trust (Parcel 2)

Unrecorded Wind Energy Lease and Agreement dated July 7, 2008 by and between Lawrence Alt, as Trustee of the Mary Lou Alt Trust and Hoopeston Wind LLC, a Delaware limited liability company, as evidenced by that certain Memorandum of Lease dated July 7, 2008, recorded April 21, 2009, as Document No. 09-03473, as amended and ratified by Lawrence R. Alt and James P. Alt, as Trustees of the Brian A. Alt Trust; and

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Mark E. Alt and Kristin L. Alt, as Trustees of the Mark E. Alt and Kristin L. Alt Trust, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Ratification, dated March 3, 2014, recorded March 24, 2014, as Document No. 14-01784, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 3, 2014

Lease 028
IL-HOO-028
Donna J Mason, Trustee of the Donna J. Mason Revocable Trust, Life Estate
John C. Mason, Jr., Trustee of the John C. Mason Jr. Revocable Trust, Life Estate
John Charles Mason, Remainderman, an undivided ¼ interest
Jeffrey Cole Mason, Remainderman, an undivided ¼ interest
Michael Lewis Mason, Remainderman, an undivided ¼ interest
Steven Christopher Mason, Remainderman, an undivided ¼ interest

Unrecorded Wind Energy Lease and Agreement by and between John C. Mason, Jr., Managing Partner of Mason Family Farm, and Hoopeston Wind LLC, a Delaware limited liability company, dated September 3, 2009 as evidenced by that certain Memorandum of Lease, dated September 3, 2009, recorded April 12, 2012, as Document No. 12-032023, as amended and ratified by Donna J. Mason, Trustee of the Donna J. Mason Revocable Trust dated April 2, 1999, Life Estate; John C. John C. Mason Jr. Revocable Trust dated April 2, 1999, Life Estate; John Charles Mason, remainderman; Jeffrey Cole Mason, remainderman; Michael Lewis Mason, remainderman; and Steven Christopher Mason, remainderman , by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, dated March 26, 2014, recorded April 14, 2014, as Document No. 14-02364, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated May 8, 2014

Lease 029
IL-HOO-029
DocsFarms LLC

Unrecorded Wind Energy Lease and Agreement by and between John C. Mason, Jr. as Managing Partner of Mason Homann Partnership and Hoopeston Wind LLC, a Delaware limited liability company, dated September 3, 2009, as evidenced by that certain Memorandum of Lease, dated September 3, 2009, recorded April 12, 2012, as Document No. 12-03186, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 5, 2014, and as amended and ratified by DocsFarms LLC, an Illinois limited liability company, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Ratification, dated March 6, 2014, recorded March 13, 2014, as Document No. 14-01513, Official Public Records, Vermilion County, Illinois

Lease 030

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IL-HOO-030
William M. Blair, Jr., Trustee of the Blair Siblings Trust

Unrecorded Wind Energy Lease and Agreement by and between Maurice and Opal Blair and Hoopeston Wind LLC, a Delaware limited liability company, dated May 28, 2008 as evidenced by that certain Memorandum of Lease, dated May 28, 2008, recorded April 21, 2009, as Document No. 09-03468, as amended and ratified by William M. Blair, Jr., Trustee of the W. M. Blair Family Trust dated May 5, 2009, by that certain unrecorded First Amendment to Wind Energy Lease and Agreement dated September 19, 2013, as amended by that certain Second Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, dated February 15, 2014, recorded March 6, 2014, as Document No. 14-01302, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 4, 2014, and as amended and ratified by William M. Blair, Jr., Trustee of the Blair Siblings Trust by that certain Amendment to Wind Energy Lease and Agreement, Joinder and Ratification, dated March 21, 2014, recorded March 26, 2014, as Document No. 14-01864, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 21, 2014

Lease 031
IL-HOO-031
Olson Acres, LLC

Unrecorded Wind Energy Lease and Agreement by and between Olson Acres, LLC and Hoopeston Wind LLC, a Delaware limited liability company, dated November 9, 2009, as evidenced by that certain Memorandum of Lease, dated November 9, 2009, recorded April 12, 2012, as Document No. 12-03205, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 8, 2014

Lease 032
IL-HOO-032
The Gernand Family Limited Partnership

Unrecorded Wind Energy Lease and Agreement by and between Peter L. Gernand, Sr. and Hoopeston Wind LLC, a Delaware limited liability company, dated February 15, 2009, as evidenced by that certain Memorandum of Lease, dated January 2, 2009, recorded April 21, 2009, as Document No. 09-03481, as amended and ratified by the Gernand Family Limited Partnership, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, dated March 18, 2014, recorded March 26, 2014, as Document No. 14-01858, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 18, 2014

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Lease 033
IL-HOO-033
Philip D. Duncan and Sondra M. Duncan

Unrecorded Wind Energy Lease and Agreement by and between Phil and Sondra Duncan and Hoopeston Wind LLC, a Delaware limited liability company, dated October 10, 2009, as evidenced by that certain Memorandum of Lease, dated March 4, 2014, recorded March 13, 2014, as Document No. 14-01514, Official Public Records, Vermilion County, Illinois, as amended and ratified by Philip D. Duncan a/k/a Phil Duncan and Sondra M. Duncan, husband and wife, by that certain unrecorded First Amendment to Wind Energy Lease and Agreement, and Ratification, dated March 4, 2014, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 4, 2014

Lease 034
IL-HOO-034
Randie Orr and Tamara Orr

Unrecorded Wind Energy Lease and Agreement by and between Randie D and Tamara L. Orr and Hoopeston Wind LLC, a Delaware limited liability company, dated May 30, 2008 as evidenced by that certain Memorandum of Lease dated May 30, 2008, recorded April 21, 2009, as Document No. 09-03470, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 4, 2014, and as amended by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Ratification, dated March 17, 2014, recorded March 24, 2014, as Document No. 14-01786, Official Public Records, Vermilion County, Illinois

Lease 035
IL-HOO-035
Lorraine M. Tobeck, Trustee of the Lorraine M. Tobeck Trust and the Raymond H. Tobeck Trust

Unrecorded Wind Energy Lease and Agreement by and between Raymond H. and Lorraine M. Tobeck, and Hoopeston Wind LLC, a Delaware limited liability company, dated June 25, 2008, as evidenced by that certain Memorandum of Lease dated June 25, 2008, recorded April 21, 2009, as Document No. 09-03472, as amended and ratified by Lorraine M. Tobeck, Trustee of the Raymond H. Tobeck Trust dated the 24th day of February, 1997, and as Trustee of the Lorraine M. Tobeck Trust dated the 24th day of February, 1997, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum and Joinder and Ratification, dated July 1, 2013, recorded August 30, 2013, as Document No. 13-07671, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 10, 2014

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Lease 036
IL-HOO-036
Robert Totheroh, Trustee of the Louise Totheroh Marital Trust and Robert Totheroh, Trustee of the Totheroh Family Trust, an undivided 2/8 interest
Robert Totheroh, an undivided 2/8
Lillian L. Totheroh, an undivided 2/8 interest
Lillian L. Totheroh, Life Estate, an undivided 2/8
Gerald R. Totheroh, Timothy F. Totheroh, Sandra K. Satterwhite and Debra A. Kinnett, an undivided 2/8 interest, Remainderman

Unrecorded Wind Energy Lease and Agreement by and between Robert Totheroh, individually, and as Trustee of the Louise Totheroh Marital Trust; Lillian Totheroh, individually and as life estate tenant; Gerald R. Totheroh, Sandra K. Satterwhite, Timothy L. Totheroh, and Debra A. Kinnett, remaindermen, and Hoopeston Wind LLC, a Delaware limited liability company, dated August 6, 2008 as evidenced by that certain Memorandum of Lease dated August 6, 2008, recorded April 21, 2009, as Document No. 09-03498, as amended and ratified by Robert Totheroh, individually, as Trustee of the Louise Totheroh Marital Trust, and as Trustee of the Totheroh Family Trust; Lillian Totheroh, individually and as life estate tenant; Gerald R. Totheroh, remainderman; Sandra K. Satterwhite, remainderman; Timothy F. Totheroh, remainderman; and Debra A. Kinnett, remainderman, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Ratification, dated March 15, 2014, recorded March 26, 2014, as Document No. 14-01859, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 24, 2014

Lease 037
IL-HOO-037
Russell T. Williams, Trustee of the Russell Williams Trust and of the Maxine Williams Trust

Unrecorded Wind Energy Lease and Agreement dated November 10, 2008, by and between Russell T. Williams, Trustee and Hoopeston Wind LLC, a Delaware limited liability company, as evidenced by that certain Memorandum of Lease dated November 10, 2008, recorded April 21, 2009, as Document No. 09-03488,as amended and ratified by Russell T. Williams, Trustee of the Russell Williams Trust u/a/d May 16, 1997, and Russell T. Williams, Trustee of the Maxine Williams Trust u/a/d May 16, 1997, dated March 4, 2014, recorded March 13, 2014, as Document No. 14-01508, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 4, 2014

Lease 038
IL-HOO-038

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Scott Willard and Melinda Willard

Unrecorded Wind Energy Lease and Agreement dated July 20, 2008 by and between Melinda Willard and Hoopeston Wind LLC, a Delaware limited liability company, as evidenced by that certain Memorandum of Lease by and between Scott Willard and Melinda Willard and Hoopeston Wind LLC, dated July 18, 2008, recorded April 21, 2009, as Document No. 09-03474, as amended and ratified by Melinda Willard and Scott Willard, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, dated February 25, 2914, recorded March 13, 2014, as Document No. 14-01509, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 4, 2014

Lease 039
IL-HOO-039
Skip Betka and Melissa Betka

Unrecorded Wind Energy Lease and Agreement dated May 29, 2008 by and between Skip and Melissa Betka and Hoopeston Wind LLC, a Delaware limited liability company, as evidenced by that certain Memorandum of Lease dated May 29, 2008, recorded April 21, 2009, as Document No. 09-03471, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 4, 2014

Lease 040
IL-HOO-040
Jean E. Stewart , Trustee of the Stewart Family Trust

Unrecorded Wind Energy Lease and Agreement by and between The Stewart Family Trust and Hoopeston Wind LLC, a Delaware limited liability company, dated June 28, 2008, as evidenced by that certain Memorandum of Lease dated June 28, 2008, recorded April 21, 2009, as Document No. 09-03475, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 25, 2014, and as amended and ratified by Jean E. Stewart, Trustee of the Stewart Family Trust under agreement dated August 12, 1991, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, dated March 3, 2014, recorded March 13, 2014, as Document No. 14-01510, Official Public Records, Vermilion County, Illinois

Lease 041
IL-HOO-041
Mann Brothers, Inc.

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Unrecorded Wind Energy Lease and Agreement by and between Mann Brothers, Inc. and Hoopeston Wind LLC, a Delaware limited liability company, dated February 10, 2009, as evidenced by that certain Memorandum of Lease recorded April 21, 2009, as Document No. 09-03482, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 4, 2014

Lease 042
IL-HOO-042
Norma Jean Smith, Trustee of the Norma J. Smith Trust

Unrecorded Wind Energy Lease and Agreement by and between Norma J. Smith, Trustee and Hoopeston Wind LLC, a Delaware limited liability company, dated July 24, 2009, as evidenced by that certain Memorandum of Lease dated July 24, 2009, recorded April 12, 2012, as Document No. 12-03189, as amended and ratified by Norma Jean Smith, Trustee of the Norma J. Smith Trust under Trust Agreement dated June 18, 1993, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, dated February 28, 2014, recorded March 13, 2014, as Document No. 14-01511, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 24, 2014

Lease 043
IL-HOO-043
Charles E. Maxwell

Unrecorded Wind Energy Lease and Agreement dated October 7, 2009, by and between Charles E. Maxwell and Hoopeston Wind LLC, a Delaware limited liability company, as evidenced by that certain Memorandum of Lease dated October 7, 2009, recorded April 12, 2012, as Document No. 12-03190 , as amended by that certain First Amendment to Memorandum of Lease, dated February 3, 2014, recorded February 27, 2014, as Document No. 14-01122, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 28, 2014

Lease 044
IL-HOO-044
DocsFarms LLC

Unrecorded Wind Energy Lease and Agreement by and between John C. Mason, Jr., Trustee of the J. C. Mason Trust B and Hoopeston Wind LLC, a Delaware limited liability company, dated September 3, 2009, as evidenced by that certain Memorandum of Lease dated September 3, 2009, recorded April 12, 2012, as Document No. 12-03191, as amended by that certain unrecorded Amended and Restated Wind Energy Lease and

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Agreement by and between DocsFarms, LLC, an Illinois limited liability company, and Hoopeston Wind LLC, a Delaware limited liability company, dated January 30, 2014, as evidenced by that certain Amended and Restated Memorandum of Lease dated January 30, 2014, recorded February 27, 2014, as Document No. 14-01123, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 5, 2014

Lease 045
IL-HOO-045
Donna J. Mason, Trustee of the Donna J. Mason Revocable Trust
John C. Mason, Jr., Trustee of the John C. Mason, Jr. Revocable Trust

Unrecorded Wind Energy Lease and Agreement by and between John C. Mason Jr., Trustee of the Donna and John C. Mason Trust, and Hoopeston Wind LLC, a Delaware limited liability company, dated September 3, 2009, as evidenced by that certain Memorandum of Lease recorded April 12, 2012, as Document No. 12-03192, as amended and ratified by Donna J. Mason, Trustee under the Donna J. Mason Revocable Trust, dated April 2, 1999, as to an undivided ½ interest, and John C. Mason, Jr., Trustee under the John C. Mason, Jr., Revocable Trust, dated April 2, 1999, as to an undivided ½ interest, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, dated February 26, 2014, recorded March 13, 2014, as Document No. 14-01516, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 5, 2014

Lease 046
INTENTIONALLY DELETED

Lease 047
IL-HOO-047
Charles E. Maxwell

Unrecorded Wind Energy Lease and Agreement by and between Charles E. Maxwell and Hoopeston Wind LLC, a Delaware limited liability company, dated March 22, 2011, as evidenced by that certain Memorandum of Lease, dated March 22, 2011, recorded April 12, 2012, as Document No. 12-03194, as amended by that certain First Amendment to Memorandum of Lease, dated February 3, 2014, recorded February 27, 2014, as Document No. 14-01124, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 28, 2014

Lease 048
INTENTIONALLY DELETED

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Lease 049
IL-HOO-049
Robert L. Alexander, Trustee of the Robert Alexander Revocable Living Trust

Unrecorded Wind Energy Lease and Agreement by and between Robert L. Alexander, Trustee of the Robert Alexander Revocable Living Trust, and Hoopeston Wind LLC, a Delaware limited liability company, dated August 12, 2008, as evidenced by that certain Memorandum of Lease, dated August 12, 2008, recorded April 4, 2012, as Document No. 12-03196, as amended and ratified by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, dated August 6, 2013, recorded August 30, 2013, as Document No. 13-07672, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 22, 2014

Lease 050
IL-HOO-050
Eugene Smith, Trustee of the Eugene Smith Trust
Norma J. Smith, Trustee of the Norma Smith Trust

Unrecorded Wind Energy Lease and Agreement by and between Eugene Smith and Hoopeston Wind LLC, a Delaware limited liability company, dated September 25, 2009, as evidenced by that certain Memorandum of Lease dated September 25, 2009, recorded April 12, 2012, as Document No. 12-03197, as amended and ratified by Eugene Smith, Trustee of the Eugene Smith Trust u/a/d June 18, 1993, and Norma J. Smith, Trustee of the Norma Smith Trust u/a/d June 18, 1993, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, dated February 21, 2014, recorded March 6, 2014, as Document No. 14-01303, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 24, 2014

Lease 051
IL-HOO-051
Raymond D. Willard and Dorothy A. Willard

Unrecorded Wind Energy Lease and Agreement by and between Ray and Dorothy Willard and Hoopeston Wind LLC, a Delaware limited liability company, dated October 23, 2009, as evidenced by that certain Memorandum of Lease, dated October 23, 2009, recorded April 12, 2012, as Document No. 12-03198, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 6, 2014

Lease 052
IL-HOO-052

UNOFFICIAL COPY

James P. Hatfield and Caryn H. Hatfield

Unrecorded Wind Energy Lease and Agreement dated October 10, 2009, by and between James P. Hatfield, Caryn M. Hatfield and Hoopeston Wind LLC, a Delaware limited liability company, as evidenced by that certain Memorandum of Lease dated October 10, 2009, recorded April 12, 2012, as Document No. 12-03199, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 10, 2014

Lease 053
IL-HOO-053
John C. Mason, Trustee of the John C. Mason Trust

Unrecorded Wind Energy Lease and Agreement by and between John C. Mason. Trustee of the John C. Mason Trust and Hoopeston Wind LLC, a Delaware limited liability company, dated August 27, 2009, as evidenced by that certain Memorandum of Lease, dated August 27, 2009, recorded April 12, 2012, as Document No. 12-03202, as amended and ratified by John C. Mason, as Trustee of the John C. Mason Declaration of Trust dated March 20, 2002, by that certain First Amendment to Memorandum of Lease, and Joinder and Ratification, dated January 29, 2014, recorded February 27, 2014, as Document No. 14-01125, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 25, 2014

Lease 054
IL-HOO-054
Jean E. Stewart, Trustee of the Stewart Family Trust

Unrecorded Wind Energy Lease and Agreement by and between Stewart Family Trust and Hoopeston Wind LLC, a Delaware limited liability company, dated September 30, 2009, as evidenced by that certain Memorandum of Lease, dated September 30, 2009, recorded April 12, 2012, as Document No. 12-03206, as amended and ratified by Jean E. Stewart, as Trustee of the Stewart Family Trust under Agreement dated August 12, 1991, by that certain First Amendment to Wind Energy Lease and Agreement, Memorandum, and Joinder and Ratification, dated February 20, 2014, recorded March 6, 2014, as Document No. 14-01304, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 25, 2014

Lease 055
IL-HOO-055
Millie A. Justice and James P. Hatfield, Co-Trustees of the Richard L. Hatfield Irrevocable Living Trust Agreement
Millie Justice

Thomas O'Shaughnessy Vermilion County Recorder Doc # 14-09577 Page 68 OF 71

UNOFFICIAL COPY

James P. Hatfield

Unrecorded Wind Energy Lease and Agreement by and between Millie Justice and James P. Hatfield, Individually and as Co-Trustees of the Richard L. Hatfield Irrevocable Living Trust and Hoopeston Wind LLC, a Delaware limited liability company, dated October 16, 2009, as evidenced by that certain Memorandum of Lease dated October 16, 2009, recorded April 12, 2012, as Document No. 12-03207, as amended by that certain First Amendment to Memorandum of Lease, dated March 5, 2014, recorded March 13, 2014, as Document No. 14-01517, Official Public Records, Vermilion County, Illinois, and as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated March 5, 2014

Lease 056
IL-HOO-056

Intentionally not included at this time

Fee Parcel 057
IL-HOO-057
Hoopeston Wind, LLC

Warranty Deed by and between Bush, L.L.C., a Washington limited liability company, and Hoopeston Wind, LLC, a Delaware limited liability company, dated May 9, 2014, recorded May 20, 2014, as Document No. 14-03553, Official Public Records, Vermilion County, Illinois

Lease 058
IL-HOO-058
Forest W. Peters, Jr. and Mary E. Peters

Unrecorded Wind Energy Lease and Agreement by and between Forest W. Peters, Jr. and Mary E. Peters, husband and wife, and Hoopeston Wind LLC, a Delaware limited liability company, dated January 30, 2014, as evidenced by that certain Memorandum of Lease, dated January 30, 2014, recorded February 27, 2014, as Document No. 14-01126, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 26, 2014

Lease 059
IL-HOO-059
Jean E. Stewart, Trustee of the Stewart Family Trust

Unrecorded Wind Energy Lease and Agreement by and between Jean E. Stewart, as Trustee of the Stewart Family Trust under Agreement dated August 12, 1991, and

Thomas O'Shaughnessy Vermilion County Recorder Doc # 14-03577 Page 69 OF 71

UNOFFICIAL COPY

Hoopeston Wind LLC, a Delaware limited liability company, dated January 28, 2014, as evidenced by that certain Memorandum of Lease, dated January 28, 2014, recorded February 27, 2014, as Document No. 14-01127, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 25, 2014

Lease 068
IL-HOO-068
Barnes, Barnes & Voight, LLC

Unrecorded Wind Energy Lease and Agreement by and between Barnes, Barnes & Voight, L.L.C., a Michigan limited liability company, and Hoopeston Wind LLC, a Delaware limited liability company, dated February 13, 2014, as evidenced by that certain Memorandum of Lease, dated February 13, 2014, recorded March 13, 2014, as Document No. 14-01512, Official Public Records, Vermilion County, Illinois, as amended by that certain unrecorded Amendment to Wind Energy Lease and Agreement, dated February 28, 2014

Lease 094
IL-HOO-094
William M. Blair, Jr., Trustee under the Blair Siblings Trust dated May 20, 2010

Unrecorded Operations and Maintenance Facility Ground Lease and Agreement dated as of July 14, 2014, by and between Borrower, as tenant, and William M. Blair, Jr., Trustee under the Blair Siblings Trust dated May 20, 2010, as landlord, as evidenced by that certain Memorandum of Operations and Maintenance Facility Ground Lease and Agreement, dated July 14, 2014, recorded August 14, 2014 as Document No. 14-05888, Official Public Records, Vermilion County, Illinois

UNOFFICIAL COPY

SCHEDULE D TO
SECOND AMENDMENT TO
CONSTRUCTION MORTGAGE ET AL.

Legal Description of Easement Parcel

Easement Parcel 088
IL-HOO-088
Robert Brown

THE PROPERTY CONSISTS OF ALL OF THE FOLLOWING LAND, SITUATED IN THE COUNTY OF VERMILION, IN THE STATE OF ILLINOIS.

PART OF THE NORTHEAST QUARTER OF SECTION 12, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE 2ND P.M., DESCRIBED AS FOLLOWS:

PARCEL I:
BEGINNING ON THE SOUTH LINE OF THE NORTHEAST QUARTER OF SECTION 12, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE 2ND P.M., 1838 FEET WEST OF THE SOUTHEAST CORNER OF SAID NORTHEAST QUARTER; RUNNING THENCE WEST 140 FEET ON SAID SOUTH LINE; THENCE 90 DEGREES 00 MINUTES TO THE RIGHT 252 FEET; THENCE EAST 140 FEET PARALLEL WITH SAID SOUTH LINE; AND THENCE SOUTH 252 FEET TO THE PLACE OF BEGINNING, SITUATED IN VERMILION COUNTY, ILLINOIS.

PARCEL II:
COMMENCING AT THE SOUTHEAST CORNER OF THE NORTHEAST QUARTER OF SECTION 12, TOWNSHIP 22 NORTH, RANGE 13 WEST OF THE 2ND P.M.; RUNNING THENCE WEST 1978 FEET ON THE SOUTH LINE OF SAID NORTHEAST QUARTER; THENCE 90 DEGREES 00 MINUTES TO THE RIGHT 252 FEET TO A TRUE POINT OF BEGINNING; THENCE WEST 200 FEET PARALLEL WITH SAID SOUTH LINE; THENCE 90 DEGREES 00 MINUTES TO THE LEFT 252 FEET; THENCE EAST 200 FEET PARALLEL WITH SAID SOUTH LINE; AND THENCE NORTH 252 FEET TO THE PLACE OF BEGINNING, SITUATED IN VERMILION COUNTY, ILLINOIS.

TAX PARCEL REFERENCE: 07-12-200-002 (1.97 ACRES)

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PARTIAL RELEASE OF NOTICE OF SUBCONTRACTORS CLAIM AND ILLINOIS MECHANIC'S LIEN CLAIM-LEASEHOLD IMPROVEMENT

STATE OF ILLINOIS)
COUNTY OF **VERMILION**)

Pursuant to and in compliance with the Illinois Statute relating to Mechanic's Liens, and for valuable consideration, receipt whereof is hereby acknowledged, the undersigned, **Ambassador Steel Fabrication, LLC, P. O. Box 627, Auburn, IN 46708**, does hereby acknowledge partial satisfaction or partial release of the Notice of Subcontractors Claim and Illinois Mechanic's Lien Claim-Leasehold Improvement against **IKEA Energy US, LLC, 420 Alan Wood Road, Conshohocken, PA 19428, Lessee/Lender, Hoopeston Wind LLC, Court Square Bldg, 301 4th St NE Ste 900, Charlottesville, VA 22902, Lessee/Contracting Entity, Apex Clean Energy, 310 4th Street NE Ste 200, Charlottesville, VA 22902, Lessee Agent and Michels Corp., 817 West Main Street, Brownsville, WI 53006, Contractor,** for **$928,621.05, leaving a balance due of $506,781.38** on the following described property to wit:

Hoopeston Wind Farm, Rossville, IL 60693, Vermilion County

which claim for lien was filed in the office of the Clerk of Court of **Vermilion** County on **December 19, 2014, Document #14-09577.**

THE ABOVE MENTIONED LIEN SHALL REMAIN IN FULL FORCE AND EFFECT FOR THE AMOUNT OF $506,781.38.

IN WITNESS WHEREOF, the undersigned has signed this instrument on **December 29, 2014.**

Ambassador Steel Fabrication, LLC

BY:_____

Allan R. Popper of Lienguard, Inc.
Agent for Ambassador Steel Fabrication, LLC
P. O. Box 627
Auburn, IN 46708

File No.: 100296-14-1

STATE OF ILLINOIS)
COUNTY OF DUPAGE) SS

Affiant, Allan R. Popper, being first duly sworn, on oath deposes and says that he is the agent of the claimant; that he has read the foregoing Partial Release or Notice of Subcontractor's Claim and Illinois Mechanic's Lien Claim and knows the contents thereof; and that all statements therein contained are true.

Allan R. Popper of Lienguard, Inc., Agent for
Ambassador Steel Fabrication, LLC
P. O. Box 627
Auburn, IN 46708

Subscribed and sworn to on **December 29, 2014**

Florence N. Santarsieri Notary Public

OFFICIAL SEAL
FLORENCE N. SANTARSIERI
NOTARY PUBLIC, STATE OF ILLINOIS
My Commission Expires 10/18/2018

Prepared by and return
Recorded document to:
Allan R. Popper
Lienguard, Inc.
1000 Jorie Blvd. Ste. 270
Oak Brook IL 60523

14-09577 71
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NOTICE OF SUBCONTRACTORS CLAIM and ILLINOIS MECHANIC'S LIEN CLAIM-LEASEHOLD IMPROVEMENT
(770 ILCS 60/7)

STATE OF ILLINOIS
COUNTY OF **VERMILION**

The claimant, **Ambassador Steel Fabrication, LLC, P. O. Box 627, Auburn, IN 46706,** hereby files a claim for lien against **IKEA Energy US, LLC, 420 Alan Wood Road, Conshohocken, PA 19428, Lessee/Lender, Hoopeston Wind LLC, Court Square Bldg, 301 4th St NE Ste 900, Charlottesville, VA 22902, Lessee/Contracting Entity, Apex Clean Energy, 310 4th Street NE Ste 200, Charlottesville, VA 22902, Lessee Agent, and Michels Corp., 817 West Main Street, Brownsville, WI 53006, Contractor,** and ALL UNKNOWN OWNERS AND NONRECORD CLAIMANTS and states:

That on **June 17, 2014,** the Lessee owned the following described leasehold in the County of **Vermilion,** State of Illinois, to wit:

See attached Legal Description of Land, identified all lessors and lessees in Vermilion County, State of Illinois

Commonly known as: **Hoopeston Wind Farm, Rossville, IL 60693, Vermilion County**

That on **June 17, 2014,** claimant made a contract with said contractor to furnish **and install reinforcing steel,** for the sum of **$2,028,669.68** and to date the materials and labor for the amount of **$2,028,669.68** have been provided to the value of **$2,028,669.68.** The last date on which materials were delivered or labor was performed was **October 3, 2014.**

That said owner is entitled to credits on account as follows: **$593,267.25**

leaving due, unpaid and owing to client, after allowing all credits, the balance of **$1,435,402.43** for which, with interest, claimant claims a lien on said land and improvements.

Ambassador Steel Fabrication, LLC

BY:_____
Allan R. Popper of Lienguard, Inc.
Agent for Ambassador Steel Fabrication, LLC
P. O. Box 627
Auburn, IN 46708

File No.: 100296-14-1

NEWS RELEASE
May 2, 2017

For Immediate Release, Contact:
Randy Christmann, (701) 328-4091
Julie Fedorchak, (701) 391-1140
Brian Kroshus, (701) 328-4195

PSC Approves Rule Changes Related to Wind Projects

BISMARCK, ND – The North Dakota Public Service Commission (PSC) has approved two sets of rule changes that strengthen requirements for future wind projects and ensure they are properly decommissioned at the end of their use. The rule changes focus on two different areas related to wind projects: (1) decommissioning requirements for when a wind farm is retired, and (2) lighting systems.

"A half century ago our ancestors made a commitment to ensure that our coal mines would be reclaimed when the prairie became quiet again," said Commission Chairman Randy Christmann. "These new rules demonstrate a renewed commitment by our generation to ensure that North Dakota's beautiful landscape will be returned to its splendor when these giant wind turbines reach the end of their usefulness."

One set of rule changes deals with decommissioning and was put in place to ensure that wind projects are properly taken down and cleaned up when the facility is no longer being used. As wind generation continues to expand in North Dakota and the projects grow in size and scale, the costs and consequences of failed or improper decommissioning have become a concern for the Commission. The rules strengthen the method of ensuring funds for decommissioning and restoration are available throughout the life of the project; heighten decommissioning requirements for future projects; and allow the Commission to effectively monitor the costs for decommissioning and restoration. The PSC has been responsible for ensuring reclamation for coal mining in the state since 1970 and incorporated that success and experience in these rule changes. The new rules include the following:

- Requires decommissioning plans, including cost estimates, are filed with and approved by the Commission prior to operation of the facility.
- Addresses the time a company is allowed to complete decommissioning and outlines specifics such as how far underground they have to remove foundations and other facilities.
- Requires financial assurance for decommissioning of projects sited after July 1, 2017. A two-phased approach will be used with an initial financial assurance being provided prior to construction and financial assurance sufficient to ensure complete decommissioning to be provided prior to operation.

"These new rules are a major step forward to ensuring that adequate resources are in place to take down and reclaim our land when these massive wind generation facilities reach the end of their useful life," said Commissioner Julie Fedorchak. "We also take a step forward in adopting new lighting technology. We will address the issue of lighting systems for new and existing facilities more deeply in our next rule package which we will initiate this summer."

The other set of rule changes deals with lights on wind towers. Current wind towers are equipped with lighting systems that feature red lights that blink 24/7 and are often unpopular with residents and visitors who want to enjoy the night sky. The new rules add a policy criteria to allow preference to be given to wind energy projects that commit to installing light mitigation technology subject to commercial availability and Federal Aviation Administration approval. The Commission has been requiring projects permitted since June 2016 to use aircraft detection lighting systems. The system has a radar that can detect when an aircraft is in the area and the lights only turn on when they are needed.

"It's important to plan for the future, to ensure the landscape is returned to its preexisting condition once the useful life of a wind energy producing facility has ended," said Commissioner Brian Kroshus. "The new rules provide the necessary financial and decommissioning assurances needed in order to implement timely, effective restoration plans."

The rule changes will now be sent to the Legislature's Administrative Rules Committee for final approval.

The North Dakota Public Service Commission is a constitutionally created state agency with authority to permit, site and regulate certain business activities in the state including electric and gas utilities, telecommunications companies, power plants, electric transmission lines, pipelines, railroads, grain elevators, auctioneers, commercial weighing devices, pipeline safety and coal mine reclamation. For more information, contact the Public Service Commission at (701) 328-2400 or www.psc.nd.gov.

###

Find us on Twitter: twitter.com/ndpsc or @NDPSC

ATTACHMENT 1

WIND TURBINE SAFETY CONSIDERATIONS

Vestas is one of the leading wind turbine manufacturers, with approximately 70% market share worldwide. Based on its prominence in the world market, the Vestas Safety Manual (32 pages) is a credible source of safety information. Nordex is another well know manufacturer of wind turbines. Its Safety Manual (130 pages) likewise is considered a credible source of information on the subject of safety.

On page 3 of the Vestas Safety Regulations for Operators and Technicians Manual, point # 2. – Stay and Traffic by the Turbine, Vestas personnel are instructed to stay away from a turbine by 400 m (1312 ft) unless it is necessary. Taken in context, this distance would apply to normal operating conditions. (See Exhibit 1)

Under abnormal operating conditions, Vestas expands this distance in consideration of the safety of its employees. This is evidenced by the Vestas Confidential Health and Safety Instruction manual for a Falmouth MA wind farm. Page 10 of this manual addresses the situation of a free spinning "runaway turbine". In that manual, instructions are for no one to be allowed within a 1640 feet (500 m) radius. (See Exhibit 2)

The Nordex Safety Manual also addresses safety in the context of a fire. On page 52, under section 9.3 Fire, it states:

DANGER ***FALLING TURBINE PARTS*** *In case of a fire in the nacelle or on the rotor, parts may fall off the wind turbine. In case of a fire, nobody is permitted within a radius of 500 m from the turbine.* (See Exhibit 3)

Given that these standards apply to employees who are familiar with the safety implications of wind turbines and are equipped to deal with abnormal conditions, it is indefensible, from a safety perspective alone, to specify in a wind ordinance designed to protect the public health, safety and welfare a setback that is less than 1640 feet.

1. Introduction

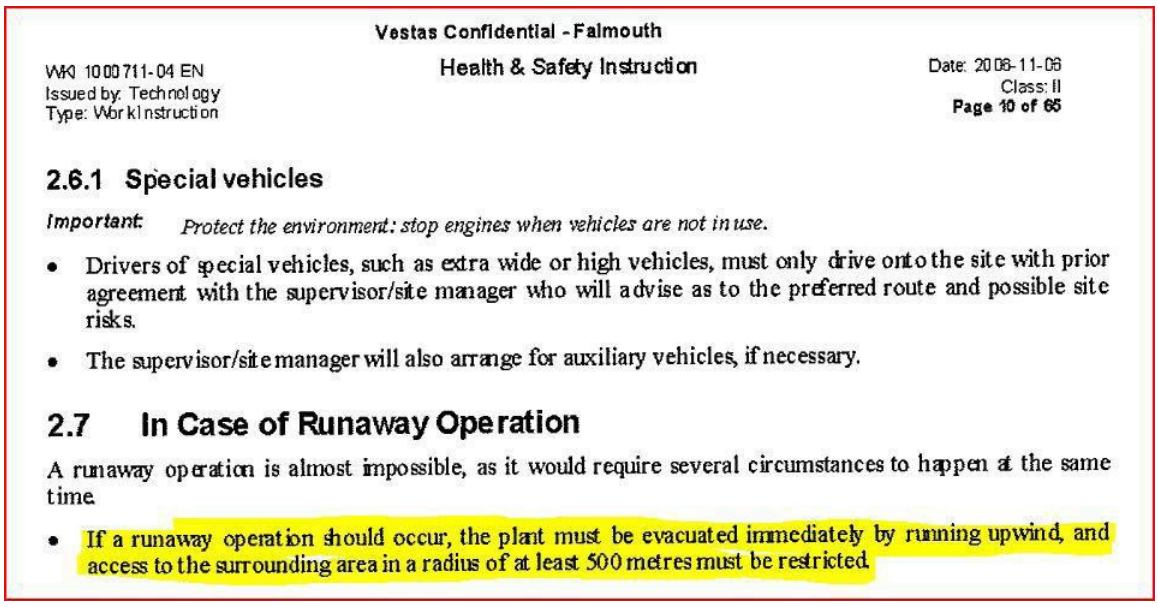
A turbine connected to the grid implies certain elements of danger if it is handled without exercising proper caution.
For safety reasons, at least two persons have to be present during a work procedure.
The work must be properly carried out in accordance with this manual and other related manuals. This implies, among other things that personnel must be instructed in and familiar with relevant partsof this manual.
Furthermore, personnel must be familiar with the contents of the “Substances and Materials” regulations.
Caution must especially be exerted in situations where measurement and work is done in junction boxes that can be connected to power.
Consequently the following safety regulations must be observed.

2. Stay and Traffic by the Turbine

Do not stay within a radius of 400m (1300ft) from the turbine unless it is necessary. If you have to inspect an operating turbine from the ground, do not stay under the rotor plane but observe the rotor from the front.
Make sure that children do not stay by or play nearby the turbine. If necessary, fence the foundation. The access door to the turbine must be locked in order to prevent unauthorized persons from stopping or damaging the turbine due to mal-operation of the controller.

3. Address and Phone Number of the Turbine

Note the address and the access road of the turbine in case an emergency situation should arise. The
address of the turbine can often be found in the service reports in the ring binders next to the ground
controller. Find the phone number of the local life-saving service.



2.6.1 Special vehicles

Important: *Protect the environment: stop engines when vehicles are not in use.*

- Drivers of special vehicles, such as extra wide or high vehicles, must only drive onto the site with prior agreement with the supervisor/site manager who will advise as to the preferred route and possible site risks.
- The supervisor/site manager will also arrange for auxiliary vehicles, if necessary.

2.7 In Case of Runaway Operation

A runaway operation is almost impossible, as it would require several circumstances to happen at the same time.

- If a runaway operation should occur, the plant must be evacuated immediately by running upwind, and access to the surrounding area in a radius of at least 500 metres must be restricted.

Vestas* advises to *"evacuate by running upwind …access to the surrounding area in a radius of at least 500 meters [1640 ft.] must be restricted."

The WT itself is adequately protected against damage by comprehensive lightning protection measures. However, persons inside or in the proximity of a WT are still at risk. ■ Initially, proceed as in a grid failure ■ Leave and lock the WT ■ Wait at a safe distance from the WT until the thunderstorm has passed Do not re-enter the WT until the thunderstorm has passed.

9.3Fire

DANGER

FALLING TURBINE PARTS

In case of a fire in the nacelle or on the rotor, parts may fall off the wind turbine. ***In case of a fire, nobody is permitted within a radius of 500 m from the turbine****.*

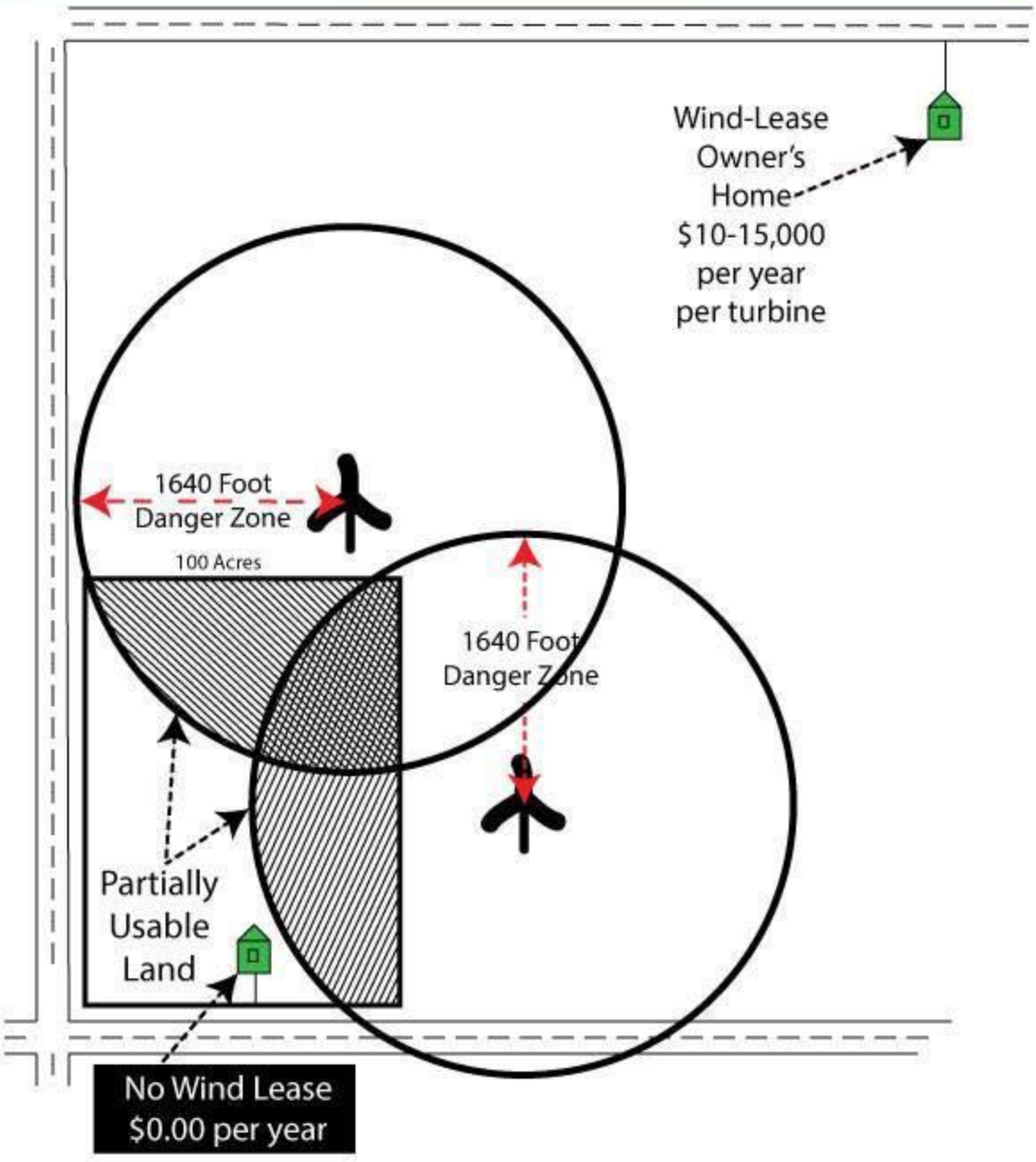
NOTE The WT is equipped with ABC powder fire extinguishers for fighting incipient fires. At least one fire extinguisher is located in the tower base near the door and another in the nacelle near the Topbox. This makes it possible to extinguish burning solids and liquids, as well as fires in electrical systems of up to 1,000 V. These fire extinguishers are not suitable for extinguishing a fire on the high-voltage elements, see Chapter 9.3.2 "Fire in medium-voltage switchgear or transformer".

9.3.1 Fire in the WT

■ Remove any persons from the danger area ■ If possible, disconnect the burning object from the grid ■ Fight the fire with available means if there is any chance of success ■ If the fire cannot be extinguished or if there is no chance of success, call the fire department ■ Inform the responsible Remote Monitoring

Trespass Zoning

The non-lease holder of a wind contract gets partial use of his land after being forced to "donate" his land to his wind-lease neighbor, without receiving compensation from anyone.



To: Mrs. Kristi Mogan,
Per our discussion I have attached several documents recommending 40 dBA Leq as the threshold for wind energy projects at homes that are directly or indirectly related to Mr. David Hessler. These are in addition to the documents I provided in an earlier emails providing some of my testimony on the topic of acceptable sound levels from wind energy utilities. All of these documents are available on public access sites but are provide to you for convenience. You have my permission to reproduce or otherwise submit them to other parties for educational (e.g. non-commercial) purposes.
The attached documents include:

1. The NARUC study by Mr. Hessler for Minnesota's PUC.

   > *"Consequently, it would be advisable for any new project to attempt to maintain a mean sound level of 40 dBA or less outside all residences as an ideal design goal." And*
   >
   > *Extensive field experience measuring operational projects indicates that sound levels commonly fluctuate by roughly +/- 5 dBA about the mean trend line and that short-lived (10 to 20 minute) spikes on the order of 15 to 20 dBA above the mean are occasionally observed when atmospheric conditions strongly favor the generation and propagation of noise.*

2. A paper prepared by Mr. Hessler's father, George Hessler, Sr., and Dr. Paul Schomer, Emeritus Director of the Acoustical Society of America's Technical and Standards committee, through which he has provided oversight to numerous ANSI and other standards published by the Acoustical Society of America, regarding sound and sound measurement of wind turbines.

   > *"Hessler Associates, Inc. has worked on over 70 wind-turbine projects over the last decade and has published a peer-reviewed journal paper recommending a design goal of 40 dBA or less at residences coupled with a maximum legal criterion of 45 dBA, all based mostly on observations and experience. Schomer and Associates, Inc. is a recognized world-wide expert in community noise and also has worked on numerous wind-turbine projects—about equally for project developers and anti-project advocacy groups. Schomer, using a wholly different approach than Hessler, recommends a design goal of 39 dBA at residences to minimize annoyance."*

3. A report prepared by for the Wisconsin PSC by Mr. Hessler's and three other acoustical firms of sound levels inside abandoned homes in the Shirley Wind where the occupants had left due to adverse health impacts.

   > *"The four investigating firms are of the opinion that enough evidence and hypotheses have been given herein to classify LFN and infrasound as a serious issue, possibly affecting the future of the industry. It should be addressed beyond the present practice of showing that wind turbine levels are magnitudes below the threshold of hearing at low frequencies."*

The references to 40 dBA Leq as the maximum sound level for wind energy utilities in the above documents have been supplemented by newer research showing that high annoyance to wind turbine sounds increases dramatically from a few percent of the population to almost 10% when the sound levels are 40 to 45 dBA Leq or higher. These new studies are covered in the first set of documents I provided.
Richard R. James

"***A subset of society should not be forced to bear the cost of a benefit for the larger society.***"
From: One Page Takings Summary: U.S Constitution and Local Land Use, by: George S. Hawkins, Esq., Stony Brook-Millstone Watershed Association

E-Coustic Solutions, LLC
Okemos, MI 48805
Tel: (517) 507-5067
Email: rickjames@e-coustic.com
45 Years of Experience in acoustical consulting related to sound measurement, control and effects

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2011

Assessing Sound Emissions from Proposed Wind Farms & Measuring the Performance of Completed Projects

NARUC Grants & Research

NARUC

October 2011

The National Association of Regulatory Utility Commissioners

A report for the Minnesota PUC
Funded by the U.S. Department of Energy

The report you are reading was created under the State Electricity Regulators Capacity Assistance and Training (SERCAT) program, a project of the National Association of Regulatory Utility Commissioners (NARUC) Grants & Research Department. This material is based upon work supported by the Department of Energy under Award Number DE-OE0000123.

The report was authored by David M. Hessler of Hessler Associates, Inc. Throughout the preparation process, the members of NARUC provided the author(s) with editorial comments and suggestions. However, the views and opinions expressed herein are strictly those of the author(s) and may not necessarily agree with positions of NARUC or those of the U.S. Department of Energy.

Special thanks to the Commissioners and staff at the Minnesota Public Utilities Commission for guiding this work, and to the Office of Electricity Delivery and Energy Reliability and the National Energy Technology Lab for their continued technical assistance to NARUC.

Please direct questions regarding this report to Miles Keogh, NARUC's Director of Grants & Research, mkeogh@naruc.org; (202) 898-2200.

Disclaimer: This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

BEST PRACTICES GUIDELINES FOR

ASSESSING SOUND EMISSIONS FROM PROPOSED WIND FARMS
and
MEASURING THE PERFORMANCE OF COMPLETED PROJECTS



October 13, 2011

Prepared for:

The Minnesota Public Utilities Commission

Under the auspices of the National Association of Regulatory Utility Commissioners (NARUC), Washington, DC.

Prepared by:

David M. Hessler, P.E., INCE
Hessler Associates, Inc.
Consultants in Engineering Acoustics
Haymarket, VA

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1.0 Introduction

The noise produced by wind turbines differs fundamentally from the noise emitted by other power generation facilities in terms of how it is created, how it propagates, how it is perceived by neighbors and how it needs to be measured. Essentially everything about it is unique and specialized techniques need to be employed in order to rationally assess potential impacts from proposed projects and to accurately measure the sound emissions from newly operational projects.

Existing ISO[1,2], and ANSI[3,4] standards that are perfectly appropriate for evaluating and measuring noise from conventional power generation and industrial facilities were not written with wind turbines in mind and contain certain provisions that make them unsuitable for application to wind turbines. For example, most test standards, quite sensibly, allow valid measurements only under low wind or calm conditions in order to preclude, or at least minimize, wind-induced directional effects, among other things. At a conventional power plant, which may operate around the clock, this requirement simply implies a wait for appropriate weather conditions. At a wind turbine project, however, there is nothing to measure during calm wind conditions, since the project is normally idle. Significant noise generation largely occurs during wind conditions that are generally above the permissible limit. At the present time, a lone standard, IEC 61400-11[5] exists for evaluating wind turbine sound levels, but only for the specific purpose of measuring the sound power level of a single unit. Sound power level is an arcane, intangible, derived quantity that is used as an input to analytical noise models and has little relevance to the sound level a wind farm is producing at someone's home. Consequently, this highly specialized test cannot be used or even adapted to serve as a way of determining whether a new multi-unit project is in compliance with a noise ordinance, for instance.

What all this suggests is that the standards and methodologies that exist for assessing and measuring noise from conventional industrial noise sources cannot be applied wholesale to wind turbine noise and completely different assessment and field measurement methodologies are required that are tailored to, and take into account, the unique circumstances and technical challenges surrounding their noise emissions. These guidelines seek to address this situation by describing suggested assessment and measurement techniques that have been developed over the past decade through field experience on roughly 70 wind projects, primarily in the Midwest and Eastern United States, nearly all of which were located in rural, yet moderately populated areas. Without question many mistakes were made in the early going into this uncharted field of study and many naïve assumptions about wind turbine noise were found to be incorrect. It is hoped that what was learned from this experience and what is summarized in these guidelines can help others circumvent this learning curve.

After a brief discussion on the nature of wind turbine noise, the following principal topics are discussed:

- Suggested design goals for new projects
- Evaluating potential noise impacts from proposed projects through noise modeling and field surveys of existing conditions
- Measuring the noise emissions from operational projects to determine compliance with design goals or regulatory limits

1.1 Executive Summary

Wind turbine noise differs fundamentally from the noise produced by other power generation and industrial sources in how it is produced, how it propagates and how it is perceived by neighbors. Because existing sound measurement standards were never written with wind turbines in mind they are largely unsuitable for use in wind turbine analyses, if only because measurements both prior to and after construction essentially must be performed in the windy conditions necessary for the project to operate – conditions that are prohibited by virtually all current test standards. Consequently, new and unique evaluation and measurement techniques must be used that are adapted to the special circumstances germane to wind turbines. These guidelines are intended to help remedy this situation by suggesting design goals for proposed project, outlining a methodology for evaluating potential impacts from new projects and describing how to accurately measure the noise emissions from operating projects.

Studies and field surveys of the reaction to operating wind projects both in Europe and the United States generally suggest that the threshold between what it is normally regarded as acceptable noise from a project and what is unacceptable to some is a project sound level that falls in a gray area ranging from about 35 to 45 dBA. Below that range the project is so quiet in absolute terms that almost no adverse reaction is usually observed and when the mean project sound level exceeds 45 dBA a certain number of complaints are almost inevitable. In view of this, it would be easy to avoid any negative impact by simply limiting the sound level from a proposed wind project to 35 dBA at all residences, but the reality is that such a stringent noise limit cannot normally be met even in sparsely populated areas and it would have the effect of preventing noise impacts by making it virtually impossible to permit and build most projects. In fairness then, any noise limit on a new project must try to strike a balance that reasonably protects the public from exposure to a legitimate noise nuisance while not completely standing in the way of economic development and project viability. It is important to realize that regulatory limits for other power generation and industrial facilities never seek or demand inaudibility but rather they endeavor to limit noise from the source to a reasonably acceptable level in terms of either an absolute limit or an allowable increase relative to the background level.

Based on the observed reaction to typical projects in United States, it would be advisable for any new project to attempt to maintain a mean sound level of 40 dBA or less outside all residences as an ideal design goal. Where this is not possible, and even that level is frequently difficult to achieve even in sparsely populated areas, a mean sound level of up to 45 dBA might be considered acceptable as long as the number of homes within the 40 to 45 dBA range is relatively small. Under no circumstances, however, should turbines

be located in places where mean levels higher than 45 dBA are predicted by pre-construction modeling at residences. It is important to note that a project sound level of 40 dBA does not mean that the project would be inaudible or completely insignificant, only that its noise would generally be low enough that it would probably not be considered objectionable by the vast majority of neighbors.

Noise impact assessments for proposed projects can be absolute or relative in nature. In an absolute analysis the sound level contours from the project are plotted over a map of the turbine layout and the surrounding potentially sensitive receptors, normally permanent residences, and the sound levels are evaluated relative to the 40 and 45 dBA criteria discussed above. A relative assessment involves, as a first step, a field survey of the existing soundscape at the site followed by a noise modeling analysis. The potential impact of the project is evaluated in terms of the differential between the existing background sound level and the calculated project-only sound level, importantly, under identical wind conditions. As a general rule of thumb, an increase of up to 5 dBA above the pre-existing L_{A90} sound level is usually found to be acceptable whereas greater increases should be avoided. This design approach only holds for background levels of about 35 dBA or above. When lower background sound levels are found a design goal of 40 dBA or less at all residences should be sought.

Commercially available software packages based on ISO 9613-2 are suggested for noise modeling analyses. Recommended modeling procedures would consist of the following steps.

- Begin with a base map showing the turbine locations and all potentially sensitive receptors in and around the project area (residences, schools, churches, etc.)
- Build up the topography of the site in the noise model if the terrain features consist of hills and valleys with a total elevation difference of more than about 100 ft. – otherwise flat terrain can be assumed
- Locate point sources at the hub height of each turbine (typically 80 m)
- Use the maximum octave band sound power level spectrum, measured per IEC 61400-11, for the planned turbine model or the loudest model of those being considered
- Assume a ground absorption coefficient (A_g from ISO 9613-2) appropriate to the site area (a moderate value of 0.5 generally works well as an annual average for rural farmland)
- Assume ISO “standard day” temperature and relative humidity values of 10 deg. C/70% RH unless the prevailing conditions at the site are substantially and consistently different than that
- Plot the sound contours from the project assuming an omni-directional wind out to a level of 35 dBA
- Evaluate the potential impact of the project at residences relative to the suggested 40 and 45 dBA thresholds

A relative impact analysis is recommended whenever unusually high or low background levels are suspected at a site, the project is large or controversial, or when there is simply

a desire to carry out a thorough analysis. The baseline field survey of existing environmental sound levels should:

- Use 6 to 14 measurement positions depending on the complexity of the site
- Select positions at residences (to the extent possible) that are representative of all the distinct settings that may be present within the site area, such as sheltered valleys, exposed hilltops, wooded areas, near major roadways, remote and secluded, etc.
- Monitor in continuous 10 minute intervals for a period of at least 14 days to capture a wide variety of wind and weather conditions
- Record a number of statistical parameters, giving precedence to the relatively conservative L_{A90} measure
- Use Type 1 or 2 integrating sound level meters fitted with oversize (7" diameter, or greater) windscreens
- Mount the microphones approximately 1 m above ground level, where feasible, to minimize self-induced wind noise
- Use one or more temporary weather stations at the most open and exposed measurement positions to record wind speed at microphone height and other parameters, such as rainfall.
- Apply a correction, if necessary, to the A-weighted sound levels for wind-induced, self-noise based on the microphone height anemometer readings
- Evaluate the L_{A90} results for consistency over the various measurement positions, segregating the results for different settings if there are clear and consistent differences
- Normalize the wind speed measured by the highest anemometers on all on-site met towers to a standard height of 10 m per Eqn. (7) of IEC 61400-11
- Correlate the design site-wide or individual setting background levels to the normalized wind speed to determine the mean value as a function of wind velocity
- Use the 6 m/s result as the critical design wind speed or determine the site-specific critical wind speed from a comparison between the turbine sound power and background levels
- Use the mean L_{A90} background level at the critical wind speed as a baseline for evaluating the modeled sound emissions of the project under those same conditions

The accurate measurement of noise from an operational project requires a determination of the concurrent background sound level present at the time each sample of operational noise is measured so that the wind and atmospheric conditions are consistent. Background levels measured at a different time and under inevitably different conditions are not suitable for use in correcting operational sound measurements.

The objective of an operational survey is to quantify the project-only sound level exclusive of background noise, which can easily be comparable to the project level at typical set back distances. Ignoring this background component will normally result in an overestimate of the project's actual sound levels.

A methodology is outlined in these guidelines for estimating the simultaneous background sound level by monitoring at a number of positions outside of the site area in locations and settings that are similar in nature to the on-site positions but remote from all turbine noise. In general, an operational survey to determine the sound emissions exclusively due to the project should:

- Use 6 to 10 on-site measurement positions depending on the complexity of the site and focused on the residences with maximum exposure to turbine noise (irrespective of their participation in the project)
- Set up 3 to 4 off-site background measurement positions at positions at least 1.5 miles from the project perimeter in diametrically opposed directions. These positions should be similar in setting and character to the on-site positions but removed from any exposure to project noise
- Monitor in continuous 10 minute intervals for a period of at least 14 days to capture a wide variety of wind and weather conditions
- Record a number of statistical parameters, giving precedence to the L_{A90} measure
- Use Type 1 or 2 integrating sound level meters fitted with oversize (7" diameter, or greater) windscreens
- Mount the microphones approximately 1 m above ground level, where feasible, to minimize self-induced wind noise
- Use one or more temporary weather stations at the most open and exposed measurement positions to record wind speed at microphone height and other parameters, such as rainfall.
- Apply a correction, if necessary, to the A-weighted sound levels for wind-induced, self-noise based on the microphone height anemometer readings
- Evaluate the off-site L_{A90} results for consistency over the various measurement positions, segregating the results for different settings if there are clear and consistent differences. Develop one or more design background levels to be used to correct the on-site levels.
- Subtract the appropriate design background level from the total measured level at each on-site receptor to derive the project-only sound level at each receptor position
- Normalize the wind speed measured by the highest anemometers on all on-site met towers to a standard height of 10 m per Eqn. (7) of IEC 61400-11
- Plot the derived project-only sound levels as a function of time or wind speed.
- Exclude all data points measured during calm conditions when the project was not operating
- Exclude all data points that appear to be associated with local contaminating noises; i.e. noise spikes, usually occurring at only one position, that are not accompanied by a simultaneous spike in wind speed
- Evaluate the final results with respect to the applicable design goal or ordinance limit. If the measured levels are lower than the design target at least 95% of the time the project can be considered in compliance.

2.0 Characteristics of Wind Turbine Noise

The magnitude and nature of wind turbine noise is entirely dependent on time-varying wind and atmospheric conditions, whereas a conventional fossil-fueled power station operates, often continuously and steadily, in a manner that is completely independent of the local environment. Consequently, a combustion turbine plant, for example, is most apt to be perceptible and a potential noise problem during calm and still weather conditions while a wind turbine project would, under most normal circumstances, not make any noise at all under those same conditions. During moderately windy conditions increased background noise would tend to diminish the perceptibility of the fossil fueled plant while the wind project would generally be at its loudest relative to the background level. At very high wind speeds background noise often becomes dominant to the extent it can obscure both sources.

In addition to simply being dependent on prevailing wind and atmospheric conditions, wind turbine noise usually has a distinctive, identifiable character to it that makes it more readily perceptible than other industrial sources of comparable magnitude[6,7,8]. The fundamental noise generation mechanism, the turbulent interaction of airflow over the moving blades, is dependent on the characteristics of the air mass flowing into the rotor plane. For example, when the airflow is fairly constant and steady in velocity over the swept area noise is generally at a minimum. While such ideal, laminar flow conditions may exist much of the time, particularly during the day, they do not occur all of the time, and the reality is that the wind often blows in the form of intermittent gusts separated by short periods of relative calm rather than as a smooth continuous stream of constant velocity. In addition, the flow may contain turbulent eddies, may be unstable in direction and the mean velocity may vary considerably over the vertical diameter of the rotor, which is typically in the 77 to 112 m (250 to 370 ft.) range on the utility scale turbines now in common use. These uneven and unstable airflow conditions generally cause more noise to be generated - and it is generated sporadically as each gust sweeps past and as the wind varies amorphously in speed or direction over the rotor plane. Such unstable conditions can lead to sound levels that change very noticeably in the short-term not only in general volume but also in character.

Qualitatively, under average circumstances rotor noise, as perceived at a common set back distance of around 400 m (1200 ft.), might be described as a churning, mildly periodic sound due to blade swish, particularly when there are several units at comparable distances from the point of observation. The normally non-synchronized and incoherent sounds from multiple units tend to blur the sound and minimize the perception of swish, although it is most commonly weak during “normal” circumstances even if only one unit is present. Another common description is that the noise is reminiscent of a plane flying over at fairly high altitude. This apt comparison is probably partly due to the basic similarity in frequency content of the two sounds but also to the phenomenon where the sound can fade in and out randomly. In the case of an actual plane it is the intervening non-homogeneous atmosphere that alternately enhances or hinders sound propagation from the distant source producing this effect while, in the case of the wind turbine, it is

more likely to be short-term variations in noise generation at the source itself, or a combination of both source and path effects.

A pure path effect that occasionally occurs is the enhanced propagation of turbine noise due to thermal layering, known as a stable atmosphere, where the air is warmer above the surface than at the surface causing sound rays to diffract downward and making a distant sound louder than it would otherwise be. At night, this phenomenon, most likely in combination with the wind speed gradient, is most likely to lead to an increase in periodic noise (generally referred to as amplitude modulation, or AM)[9,10]. The exact mechanism behind this noise, particularly when it becomes unusually pronounced, is not entirely understood, but, in simple terms, it is thought to be caused when the wind speed at the top of the rotor is significantly higher than the wind speed at the bottom; i.e. when the vertical wind speed gradient is more slanted and less vertical, as is usually the case at night. Having said that, however, this phenomenon is not always present or particularly pronounced at all sites, but *when of sufficient magnitude*, the fairly pronounced swishing or thumping sound that can result on certain evenings can and does give rise to quite legitimate complaints. In fact, this is probably the primary cause of serious complaints about wind project noise. In general, the occurrence of this phenomenon in its pronounced or enhanced form is rather rare making detailed measurements difficult[11] but a major effort[(ibid)] is currently underway in the United Kingdom seeking to quantify and further understand this noise.

2.1 Low Frequency Noise and C-weighted Sound Levels

When the swishing, thumping or beating noise alluded to above does occurs it is usually at a rate of about once per second, or 1 Hz, which is the blade passing frequency of a typical three-bladed rotor turning at 20 rpm. Although the "frequency" of its occurrence at 1 Hz obviously falls at the very low end of the frequency spectrum, this noise is not "low frequency" or infrasonic noise, per se. It is simply a periodic noise where the actual frequency spectrum may contain some slightly elevated levels in the lower frequencies but where the most prominent noise is roughly centered around 500 Hz near the middle of the audible frequency spectrum. In general, the widespread belief that wind turbines produce elevated or even harmful levels of low frequency and infrasonic sound is utterly untrue as proven repeatedly and independently by numerous investigators[12,13,14,15,16] and probably arose from a confusion between this periodic amplitude modulation noise and actual low frequency noise. Problematic levels of low frequency noise (i.e. those resulting in perceptible vibrations and complaints) are most commonly associated with simple cycle gas turbines, which produce tremendous energy in the 20 to 50 Hz region of the spectrum – vastly more than could ever be produced by a wind turbine.

The mistaken belief that wind turbines produce high levels of low frequency noise can also be attributed, perhaps even more definitively, to wind-induced microphone error where wind blowing through virtually any windscreen will cause the low end, and only the low end, of the frequency spectrum to substantially increase due to self-generated distortion. The magnitude and frequency response of this error has been theoretically/mathematically quantified by van den Berg[10] and empirically by Hessler[17]

by subjecting a variety of commonly used windscreens to known air speeds in a massively silenced wind tunnel – thereby directly measuring the frequency response to air flow alone (the specific results of this study and its applications are discussed further in Section 5.1). The results of this wind tunnel experiment were used to evaluate measurements of actual wind turbine noise at a site in Southern Minnesota by Hessler in 2008[18]. Figure 2.1.1 below shows, as an example, the frequency spectra measured under fairly windy conditions in a rural soybean field 1000 ft. from an isolated unit and, at the same time, in an identical soybean field 3 miles away from any turbines.

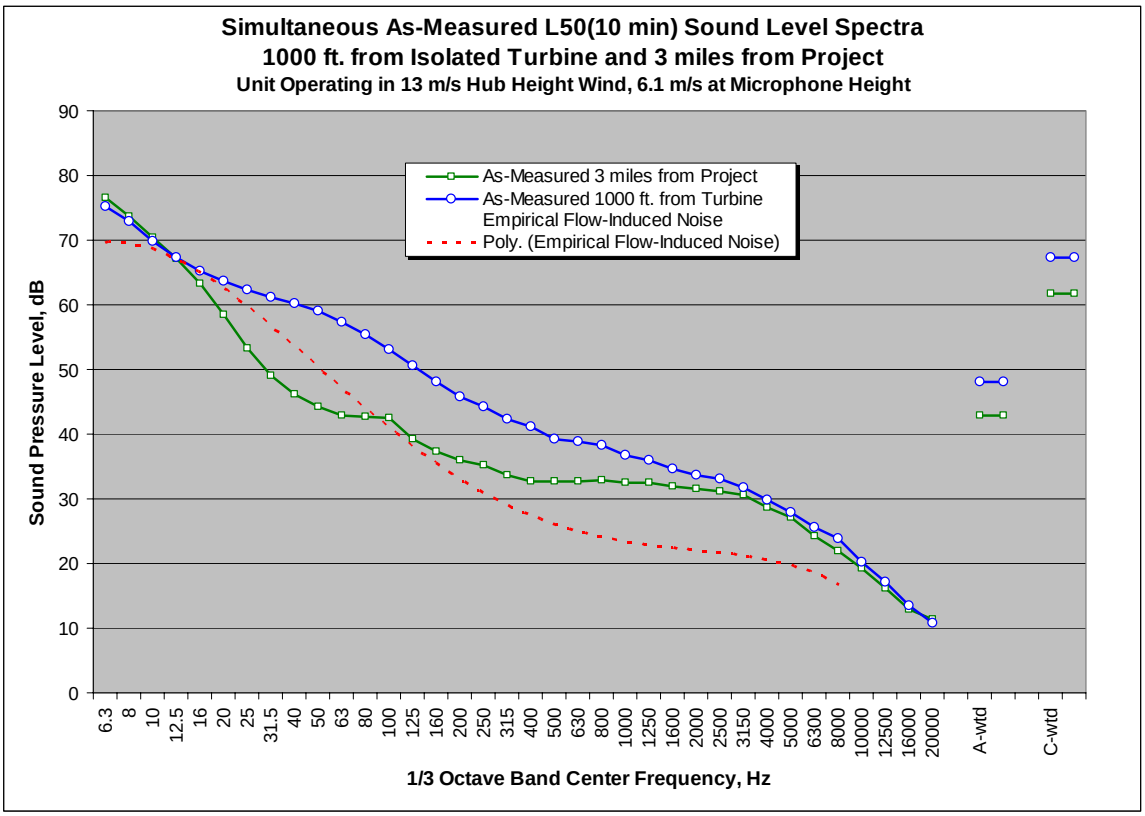


Figure 2.1.1

The two measurements show the same values in the lowest frequency bands. Since there is clearly no source of low frequency noise present in the background measurement, the low frequency levels - in both measurements – simply represent self-generated distortion and are not the actual sound emissions of anything. This can be confirmed from the wind tunnel study where the measured frequency spectrum for this particular windscreen (7" diameter) subjected to a 6.1 m/s wind is also plotted in Figure 2.1.1[a].

What all this shows is that virtually any measurement taken under moderately windy conditions will be severely affected by false-signal noise in the lower frequencies, even

[a] It should be noted that the wind tunnel results quantify the minimum amount of false-signal noise measured under more or less laminar flow conditions in the absence of possible further distortion from turbulence and atmospheric conditions.

when a large windscreen is used as in the example above. The measurement will appear to show high levels of low frequency noise - whether a wind turbine is present or not.

Figure 2.1.1 also illustrates another important point concerning C-weighted sound levels; namely, that the C-weighted levels at 1000 ft. and 3 miles are somewhat similar at 67 and 62 dBC, respectively. The significance of this is that C-weighted sound levels, as opposed to the much more common A-weighted metric, are normally used for the specific purpose of quantifying, investigating or placing a limit on noise sources that are rich in low frequency noise. The reason for this is that C-weighting does not mathematically suppress the low frequencies the way A-weighting does making it highly sensitive to and usually dominated by the low frequency content of a sound. Figure 2.1.2 shows this graphically for the example measurement at 1000 ft. from a wind turbine.

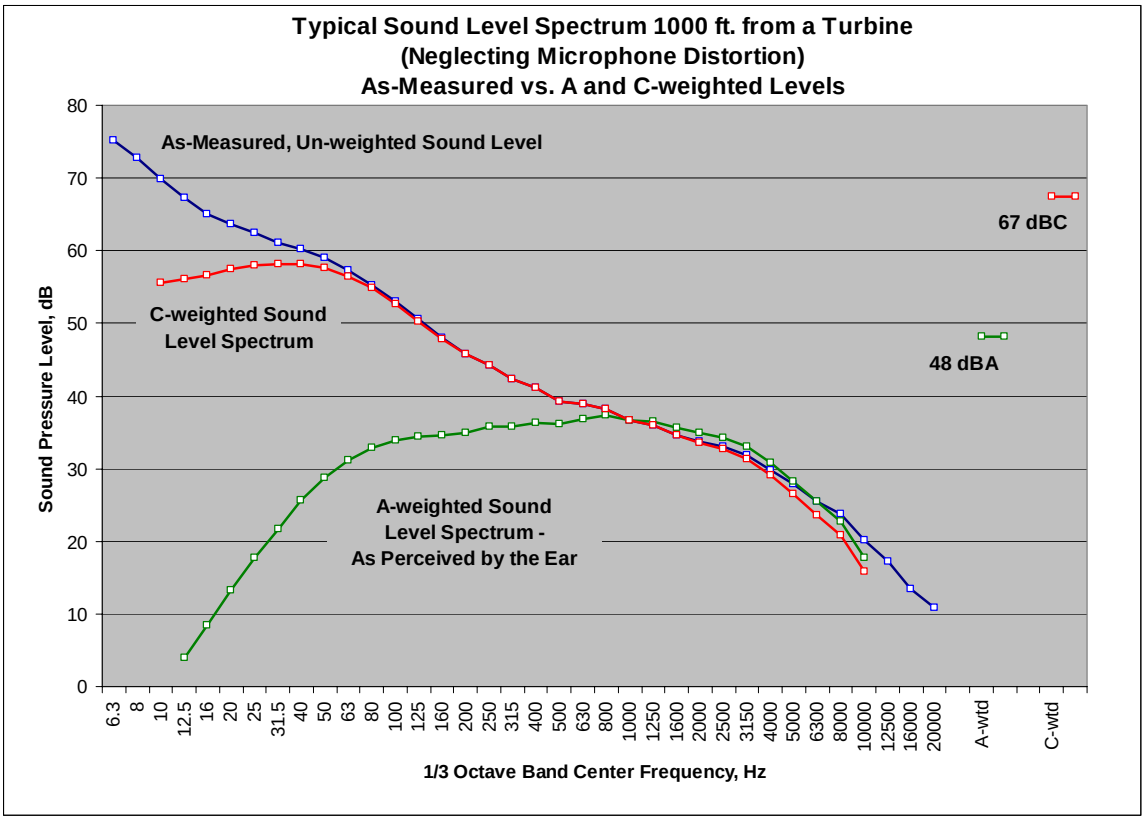


Figure 2.1.2

The as-measured sound level, warts and all, without any weighting applied is the blue trace. C-weighting reduces the low end of the frequency spectrum by a moderate amount whereas A-weighting reduces it substantially. There is no tangible or physiological rationale behind C-weighting but A-weighting serves the very useful purpose of adjusting the frequency spectrum of the sound so that it matches the way it is subjectively perceived by the human ear, which is relatively insensitive to low frequency sounds. Figure 2.1.2 shows that what is actually heard at 1000 ft. from this turbine is mid-frequency sound from roughly 100 to 2500 Hz – and even if the artificially elevated low frequency levels were actually attributable to the turbine nothing would still be audible in

the low frequencies (recall that this measurement is unadjusted for low frequency false-signal noise).

The ultimate point of this discussion is that C-weighted sound levels cannot be measured in any kind of meaningful way in the windy conditions associated with turbine operation, since they essentially quantify the level of low frequency microphone distortion rather than any actual noise.

As another example, the plot below shows the C-weighted sound levels measured over a two week period at a residence surrounded by several wind turbines and simultaneously by a monitor located miles away from the project area in a similar setting (rural Midwestern farm country).

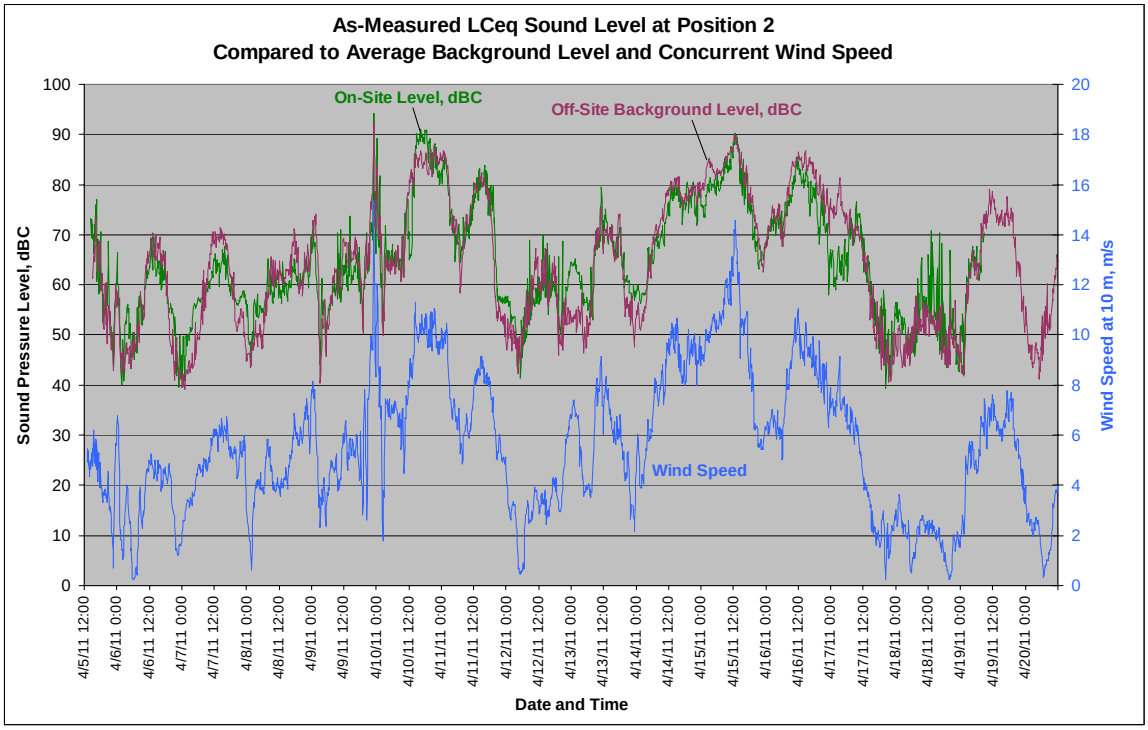


Figure 2.1.3

In essence, the levels are largely the same at both places and are more a measurement of the prevailing wind speed and its effect on the microphone rather than any real source of low frequency noise.

Consequently, despite their occasional appearance in local ordinances as an intended way of limiting the low frequency noise emissions from wind projects, by either an absolute limit or a dBA-dBC differential, C-weighted sound levels have no practical place in the measurement of wind turbine sound.

3.0 Recommended Design Goals

It would be a trivial solution to set an extremely low sound level of, say, 30 dBA as a permissible sound level for a new wind project at potentially sensitive receptors or to impose massive set back distances to any residences. While such restrictions would probably ensure that there was no adverse impact whatsoever from the project, the effective inaudibility of project noise would be due more to the fact it was never built than to its low sound emissions. Realizing virtual inaudibility or maintaining set backs of several thousand feet from all residences is generally an impracticality at all but the most remote sites. In fairness then, any noise limit on a new project must try to strike a balance that reasonably protects the public from exposure to a legitimate noise nuisance while not completely standing in the way of economic development and project viability. It is important to realize that regulatory limits for other power generation and industrial facilities never seek or demand inaudibility but rather they endeavor to limit noise from the source to a reasonably acceptable level either in terms of an absolute limit (commonly 45 dBA at night) or a relative increase over the pre-existing environmental sound level (typically 5 dBA[19]).

Research, principally by Pedersen[20,21] and Persson-Waye[22], on what the reaction is to wind turbine sound levels and what levels might be considered acceptable has been on-going for some time now in Europe. These studies analyze the responses to blind questionnaires distributed to residents living near wind farms in Sweden and The Netherlands in an effort to correlate the level of annoyance with noise and other factors with the calculated project sound level at each residence. In general, the results suggest among many other important findings that a project sound level in the 40 to 45 dBA range can lead to relatively high annoyance rates of around 20 to 25%[(ibid)]; however, it important to understand that these numbers refer to the percentage of those with exposure to such sound levels and not the entire population in the vicinity of the projects. Viewed within the context of the total survey population the rate of adverse reaction comes down to a handful of individuals or very roughly about 4 to 6% when residences are exposed to project sound levels in the 40 to 45 dBA range.

A somewhat similar rate of complaints/annoyance expressed as a percentage of the total population living within 2000 ft. of a turbine was found by Hessler[23] during compliance sound testing at a number of typical, newly operational wind projects in the United States. In each survey the total number of residents where complaints or even mild concerns about noise had been called in was obtained from project operations and the actual sound levels at all of these locations were measured over 2 to 3 week periods. The fundamental results are summarized in the following table.

Table 3.0.1 *Number of Observed Complaints Relative to the Total Number of Households in Close Proximity to Turbines [Hessler, 23]*

Project	Total Households in the Site Area (Approx.)	Number of Complaints as a Function of Project Sound Level (dBA) (a)			Total Number of Complaints	Percentage Relative to Total Households
		< 40	40 - 44	45 or Higher		
Site A	107	0	2	1	3	3%
Site B	147	0	3	3	6	4%
Site C	151	0	3	0	3	2%
Site D	268	0	2	4	6	2%
Site E	91	1	1	4	6	7%
					Overall Average:	4%
(a) Sound levels expressed as long-term, mean values						

Although the purpose of these surveys was to confirm compliance with regulatory noise and not specifically to evaluate community reaction, the findings, taken together with the European research mentioned above, suggest that the vast majority of residents living within or close to a wind farm have no substantial objections to project noise, particularly if the mean sound level is below 40 dBA. It is important to add that all of the sites investigated in these studies were just as prone as any other site to all the adverse character issues mentioned above, such as amplitude modulation, stable atmospheric conditions, highly variable sound levels and higher nighttime noise levels. While the possibility of annoyance, if not serious disturbance, can almost never be completely ruled out, it appears that the total number of complaints would be fairly small as long as the mean project level does not exceed 40 dBA. Above that point, specifically in the 40 to 45 dBA range, complaints can be expected with some certainty but, as indicated in Table 3.0.1, still at a fairly low rate of about 2% relative to the total population in close proximity to the project.

Consequently, it would be advisable for any new project to attempt to maintain a mean sound level of 40 dBA or less outside all residences as an ideal design goal. Where this is not possible, and it frequently is difficult to achieve even in sparsely populated areas, sound levels of up to 45 dBA might be considered acceptable as long as the number of homes within the 40 to 45 dBA range is relatively small. Under no circumstances, however, should turbines be located in places where mean levels higher than 45 dBA are predicted by pre-construction modeling at residences. A project sound level of 40 dBA does not mean that the project would be inaudible or completely insignificant, only that its noise would generally be low enough that it would probably not be considered objectionable by the vast majority of neighbors based on the actual reaction to other projects.

It is important to note that the sound levels in Table 3.0.1 and the suggested sound level targets discussed above are mean, long-term values and not instantaneous maxima. Wind turbine sound levels naturally vary above and below their mean or average value due to wind and atmospheric conditions and can significantly exceed the mean value at times. Extensive field experience measuring operational projects indicates that sound levels commonly fluctuate by roughly +/- 5 dBA about the mean trend line and that short-lived (10 to 20 minute) spikes on the order of 15 to 20 dBA above the mean are occasionally

observed when atmospheric conditions strongly favor the generation and propagation of noise. Because no project can be designed so that all such spikes would remain below the 40 or 45 dBA targets at all times, these values are expressed as long-term mean levels, or the central trend through data collected over a period of several weeks.

4.0 Noise Impact Assessments

4.1 Noise Modeling

The principal mechanism for evaluating the potential impact of a proposed wind project is to analytically model its noise emissions. A sound level contour map showing the expected sound emissions from the project relative to all the residences in the area is essentially a graphic illustration of the potential impact. It follows from the preceding discussion of ideal design goals that predicted levels below 40 dBA at residences can be associated with a relatively low adverse impact, while higher levels, particularly those higher then 45 dBA, suggest a relatively high probability of serious complaints.

Because there are few options to reduce noise from a project once it becomes operational, any necessary noise abatement must essentially be designed into the project while it is still in the planning stage. Computer modeling allows the potential noise impact to be visualized but, importantly, also allows mitigation options to be explored, since the effects of relocating or removing individual turbines or using alternate turbine models can be easily evaluated. Such optimization studies are best performed early in the development process while there is still some flexibility to move things around. This process can be repeated iteratively as the design develops and lease and easement agreements evolve to help keep community noise levels as low as possible within the context, of course, of many other constraints.

4.1.1 *Acceptable Sound Propagation Standards*

Wind turbine noise is actually rather simple to model because the project consists of more or less ideal point sources located high in the air. Consequently, the dominant sound propagation factor is simply spherical wave spreading with distance, which is an axiomatic law of physics that is built into every modeling software package. All other effects, such as ground or air absorption, are minor subtleties by comparison so great sophistication in modeling software is not required. In fact, all that is really necessary is to calculate sound propagation from the project using ISO 9613-2 *Acoustics – Attenuation of sound during propagation outdoors. Part 2: General method of calculation* (1996)[24], which is, by far, the prevailing and most widely accepted worldwide standard for such calculations and the basis for essentially every commercial noise modeling program.

Like the other test standards alluded to in the introduction, ISO 9613-2 was not written with wind turbines in mind and its applicability to elevated sources (usually 80 m) and long propagation distances is occasionally questioned. Table 5 in the standard gives the

estimated accuracy of the method for noise sources up to 30 m high and for propagation distances up to 1000 m. This 30 m height figure is sometimes interpreted to mean that the standard cannot be used for 80 m high sources, but it is just that no specific accuracy estimate is given for such cases, not that the standard is inappropriate. As mentioned earlier, the principal sound propagation loss in wind turbine modeling is simple geometric spreading of the sound wave, which is a phenomenon that has no dependence on the specific point of origin or its height above ground level.

Source height is a factor, however, in the relatively minor ground absorption loss (i.e. the tendency of the ground surface to variously absorb or reflect sound waves) but measurements of actual wind turbine sound levels vs. predictions show reasonably good agreement indicating that the calculation of the ground absorption loss and, indeed, the entire methodology, is perfectly valid for wind turbines.

Having said that, it should be noted that ISO 9613-2 does not consider atmospheric conditions, such as the wind and temperature gradients, stability, turbulence, etc., and was always intended to portray very long-term or average propagation conditions under slightly conservative downwind conditions. Consequently, the model results using this standard need to be interpreted as the expected sound level under "average" conditions, meaning that the actual sound level will be close to the prediction much of the time but higher *and* lower levels will occur with about equal regularity due to fluctuating atmospheric conditions, which affect both the generation and propagation of wind turbine noise. The plot below shows a typical comparison between the measured project-only sound levels over a two week period compared to predictions at various wind speeds. The model predictions tend to agree with the central trend line. The scatter evident in this chart is normal and inevitable and reflects the natural variability of wind turbine sound levels as observed at a distant point.

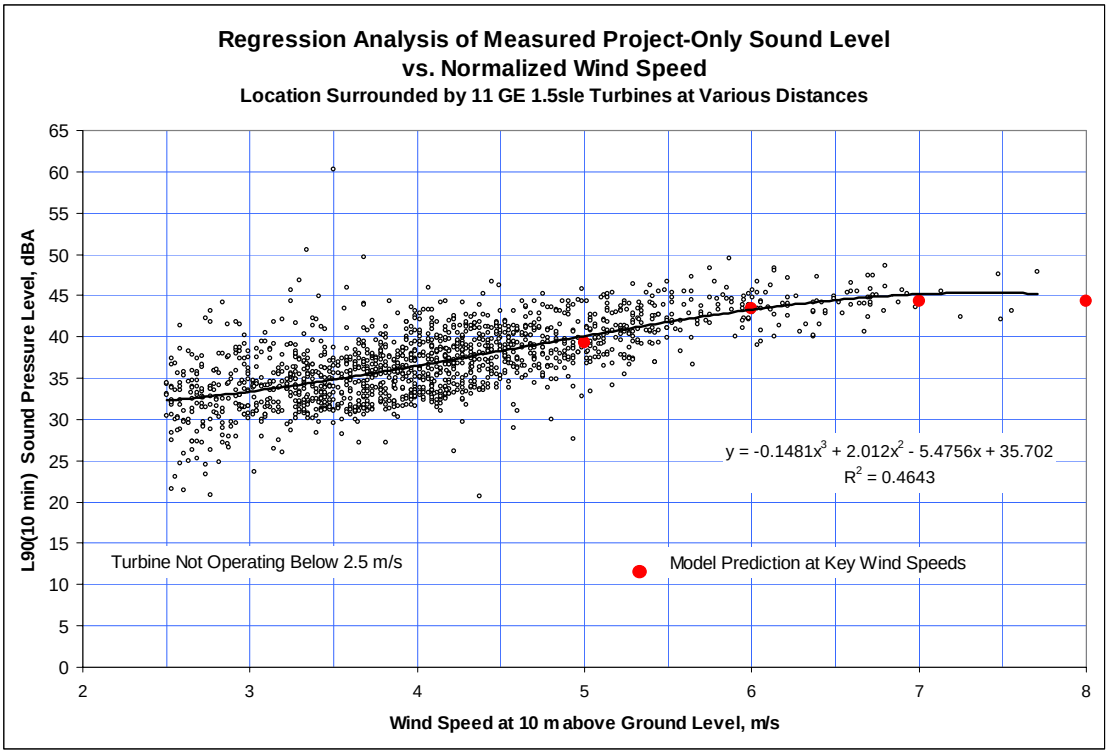


Figure 4.0.1

It should be pointed out that there is an alternative prediction methodology to ISO 9613-2 that takes atmospheric conditions into account: NORD2000[25], which is a proprietary software package that has been in development in Denmark for quite some time. However, it is rather complicated and is not in wide use partially because it has not been integrated or fully integrated into the most commonly used modeling programs. This sound emissions model is based on the fundamental mathematics of wave propagation rather than the empirical studies that form the basis for most of the propagation losses in ISO 9613-2, but despite its sophistication it does not seem to yield substantially better results than ISO 9613-2[26]. As exemplified by Figure 4.0.1, there is no reason why the more common and simpler ISO 9613-2 methodology should not be used.

4.1.2 *Modeling Software*

In theory, then, any program based on ISO 9613-2 can ostensibly be used to model wind turbines but there is more to it than the calculation of sound propagation losses. What emerges as the key differentiation between programs is basically how well and easily the site plan can be imported into the program and the quality and nature of the program's output.

Typical wind projects consist of dozens of units either spread out over many square miles in flat or rolling country or strung out along ridgelines. At the first type of site the turbines are frequently mixed in with potentially sensitive receptors (typically permanent residences) that can easily number into the hundreds. With ridgeline projects the nearest receptors are usually all around the base of the mountain or promontory on which the

turbines are proposed and the effective project area (i.e. the region where residences exist within possible earshot of the project) can be vast. Consequently, it is best, if not essential, to use a modeling program that allows for the reasonably easy importation and scaling of a site map that shows not only the turbine locations but also all of the surrounding potentially sensitive receptors. Such a map is normally in shapefile (.shp) format with a layer for the turbines, a layer for structures (unfortunately not often differentiated into houses, barns, garages, commercial buildings, etc.) and layers for other features such as roads or topography. While nominally possible, it is not normally desirable to use only numerical tables of turbine coordinates to create the model for the principal reasons that a separate base map needs to be found and imported and different coordinate systems can become confused. In addition, publically available maps (used as a base map for the model) almost never show, or at least accurately show, all the residences in the vicinity of the project.

In addition to the turbines and houses the topography of the site often needs to be considered in the model – not only because of the line sight between the turbines and houses may be partially blocked or obstructed, but more generally because the source-receptor distance at sites with fairly dramatic terrain is affected and usually lengthened when modeled in three-dimensions. Consequently, a program that has the ability to import terrain contours and then mathematically consider their effect on sound propagation is essential for any project in a hilly or mountainous setting. This factor can only be safely ignored for sites with fairly flat or gently rolling topography.

In terms of output the most important element is the ability of the program to map sound contours in high resolution over the input base map. The potential impact from any wind project is normally graphically evaluated from contour plots. It is the number of houses within a certain threshold or sound level that usually determines whether the project is likely to result in complaints or not or whether it will comply with regulatory noise limits.

In terms of specific programs, Cadna/A® developed by Datakustik GmbH (Munich, Germany), appears to be used most often by engineers and consultants and is fully capable of importing shapefiles, modeling complex terrain and producing detailed contour maps.

The second most common noise prediction program is the sound emissions component of the WindPRO® software package (EMD International A/S, Denmark), which is a generalized siting tool for wind farms. The noise prediction module is only one aspect of the much larger program.

SoundPLAN® (Braustein & Berndt GmbH, Backnang, Germany), is evidently similar in capability to Cadna/A® but, for reasons that are unclear, is not often used for wind turbine analyses despite its apparent capability to integrate the NORD2000 algorithm as an optional calculation methodology.

One other program, WindFarm® (ReSoft Ltd, U.K.), is another general project design package of which the noise component is only a small part.

Any one of these programs would be generally acceptable for modeling the noise from a new project.

4.1.3 *Model Inputs*

In contrast to models of acoustically complex fossil fueled power plants that consist of dozens of major sources, the sound levels of which often need to be estimated, the input to a wind turbine project model is a single sound power level spectrum that is known with considerable accuracy. Turbine sound power levels are tested in accordance with IEC 61400-11[5], in which highly specialized and meticulous techniques are used to derive the sound power level of a wind turbine over a range of wind speeds from 6 to 10 m/s (as measured at 10 m above ground)[b]. The best input to use for any model is the maximum octave band sound power level frequency spectrum taken directly from a field test report.

Although such reports are sometimes made available by manufacturers, it is more common for the acoustical performance to be reported second-hand (based on either an IEC 61400-11 test or analytical calculations) in a technical specification document published by the manufacturer. The reported sound levels may or may not contain an explicit design margin and/or may be stated as warranted sound levels. While input sound levels that have been artificially inflated would tend to needlessly overstate the potential impact of a project, there often isn't any alternative to using whatever performance the manufacturer decides to publish. Whatever the source of the data is, it should be clearly stated in the impact assessment report.

4.1.4 *Modeling Methodology*

Recommended procedures for modeling wind turbine project noise are as follows:

- Begin with a base map showing the turbine locations and all potentially sensitive receptors in and around the project area (residences, schools, churches, etc.)
- Build up the topography of the site in the noise model if the terrain features consist of hills and valleys with a total elevation difference of more than about 100 ft. – otherwise flat terrain can be assumed
- Locate point sources at the hub height of each turbine (typically 80 m)
- Use the maximum octave band sound power level spectrum for the planned turbine model or the loudest model of those being considered
- Assume a ground absorption coefficient (A_g from ISO 9613-2) appropriate to the site area (a moderate value of 0.5 generally works well as an annual average for rural farmland, although higher values specifically for farm fields during summer conditions may be appropriate. A value of 0 (100% reflective ground) is likely to produce highly conservative results)

[b] In its current edition (2.1). A revision to this standard has been in development for some time that would expand this wind speed range and add a number of other refinements (and complexities) to the test procedure. It is unclear whether this new edition will ever actually be adopted.

- Assume ISO “standard day” temperature and relative humidity values of 10 deg. C/70% RH unless the prevailing conditions at the site are substantially and consistently different than that
- Plot the sound contours from the project assuming an omni-directional wind out to a level of 35 dBA (shading the area between each 5 dBA gradation with a different color often greatly improves legibility)

The assumption of an omni-directional wind means that the sound power level of the turbine, which is measured in the IEC 61400-11 procedure downwind of the unit, is modeled as radiating with equal strength in all directions; i.e. the sound level in every direction is the downwind sound level. Although this may seem be depict an unrealistic situation and over-predict upwind sound levels, the fact of the matter is that this approach generally results in predictions that are consistent with measurements irrespective of the where the receptor point is located. Although somewhat counterintuitive, the reason for this is that wind turbine noise under most normal circumstances is not particularly directional and generally radiates uniformly in all directions. As an example, the plot below shows the sound levels measured in three directions 1000 ft. from a typical unit in a rural project in Southern Minnesota. Although there are periods when the levels differ, implying some directionality, the majority of the time all three sound levels are generally about same irrespective of the wind direction. Moreover, the sound level at the downwind position is almost never elevated relative to other directions as one might expect.

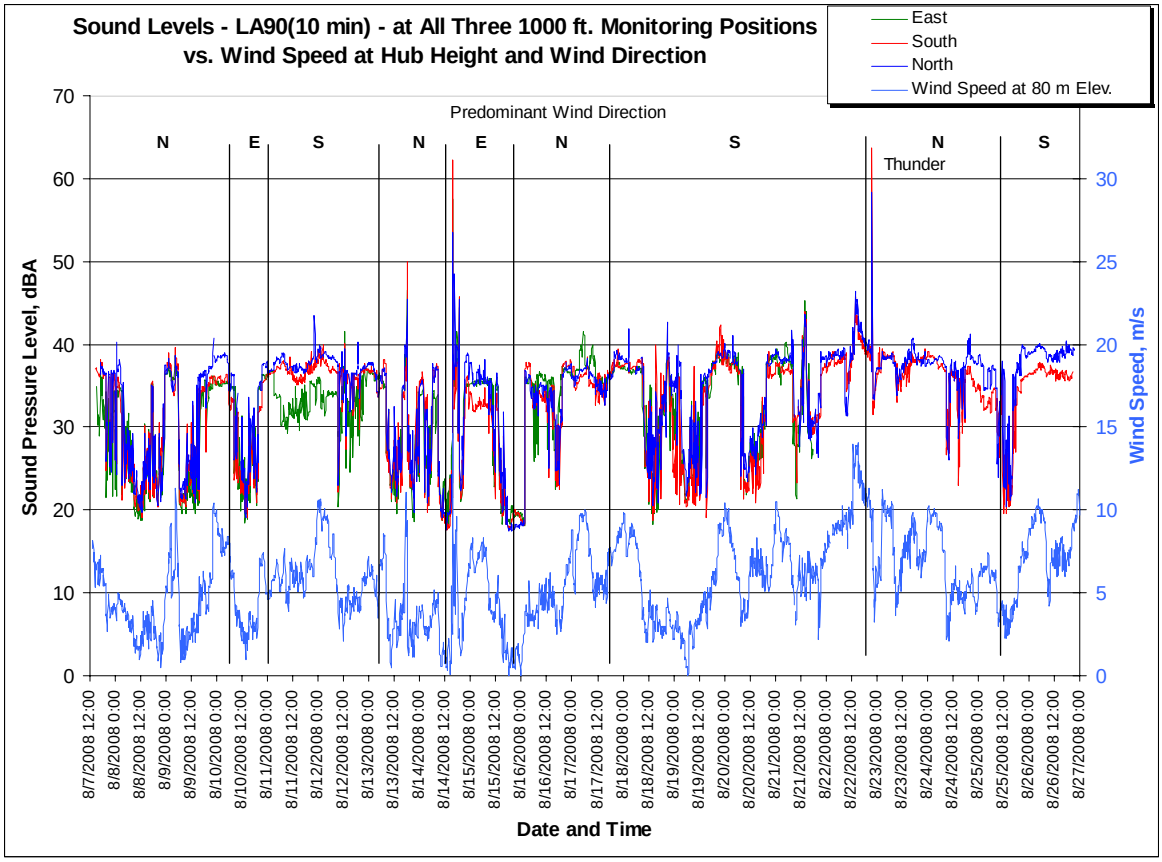


Figure 4.1.4.1 *Sound levels at 1000 ft. from a Typical Unit in Three Directions*

4.1.5 *Interpretation of Model Results*

An example plot for a hypothetical project, prepared using Cadna/A® and the procedures outlined in Section 4.1.4, is shown in Figure 4.1.5.1. In this instance, the units are located on a fairly prominent ridgeline and the topography has been recreated in the model.

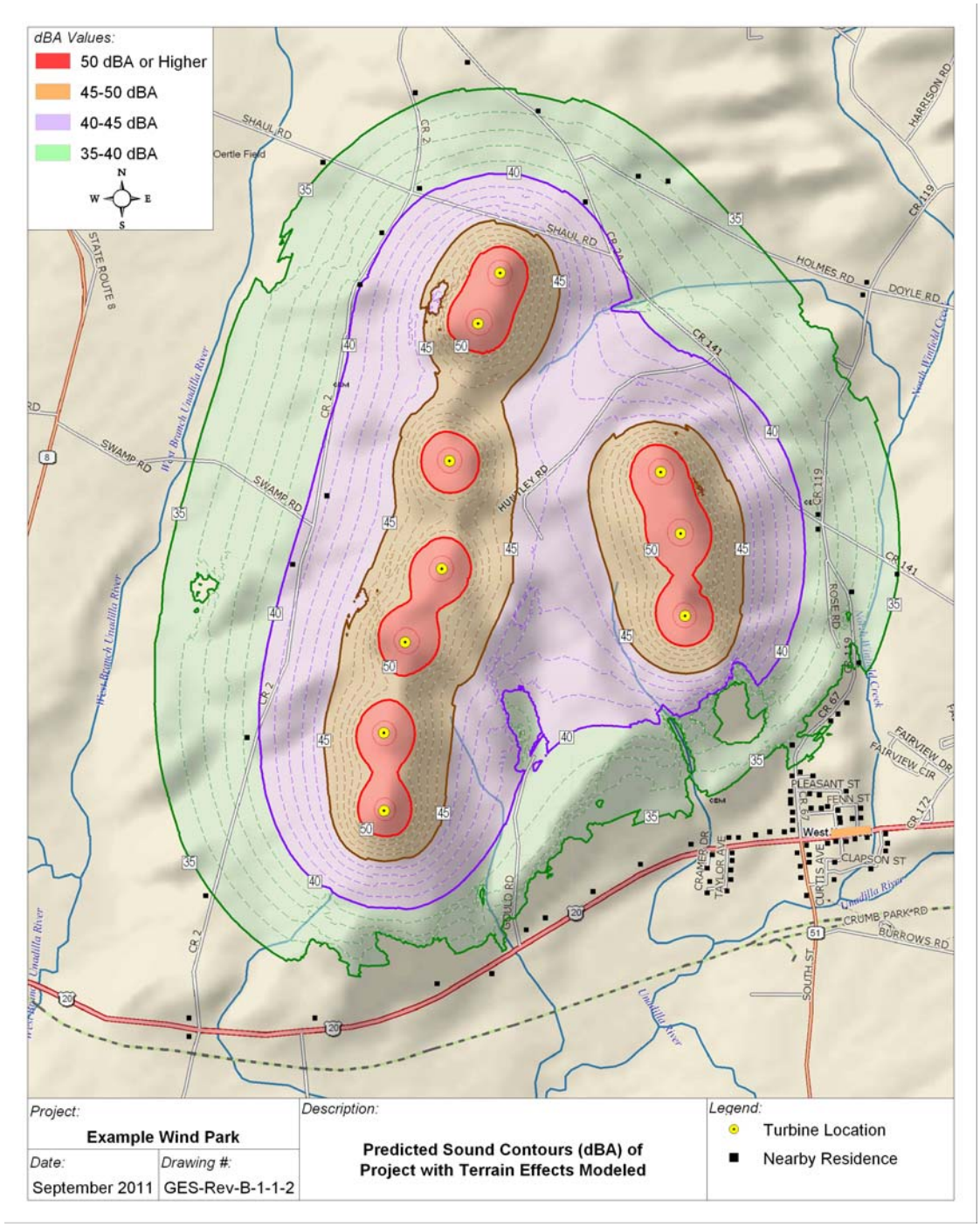


Figure 4.1.5.1 *Noise Model Plot – Example A*

Based on the plot, the potential noise impact from this project can be characterized as being fairly mild in the sense that nearly all of the residences in the vicinity of the project are expected to see a mean sound level of 40 dBA or, in most cases, less. The few houses that are nominally above 40 dBA are only marginally above that threshold and none are close to the 45 dBA absolute upper limit. The green region between 40 and 35 dBA generally represents the area where in all likelihood project noise would still be readily audible some of the time, if not much of the time, but at a fairly low magnitude. The

audibility of and reaction to sound levels in this range would be somewhat dependent on the level of natural background sound in the area, since environmental sound levels in rural areas are commonly in the mid to high 30's dBA during the moderate wind conditions necessary for the project to operate – or, in other words, the background sound level could be roughly equivalent to the project sound level limiting its perceptibility. Below 35 dBA project noise generally becomes so low that it is only rarely considered objectionable even in extremely low noise environments. Complete inaudibility does not occur for quite some distance from most projects in quiet areas because of the distinctive, periodic nature of wind turbine noise. The actual distance to the point of inaudibility varies amorphously with atmospheric conditions and is generally much further at night than during the day. Consequently, the exact reaction to any project can never be predicted with certainty because project noise is often audible to some extent, at least intermittently, far from the project. However, the studies of response to wind turbine noise discussed in Section 3.0 suggest that the threshold between a mild or acceptable impact and a fairly significant adverse reaction is a gray area centered at 40 dBA.

An additional sound contour plot is shown in Figure 4.1.5.2 representing another hypothetical but typical project, this time in essentially flat Midwestern farm country.

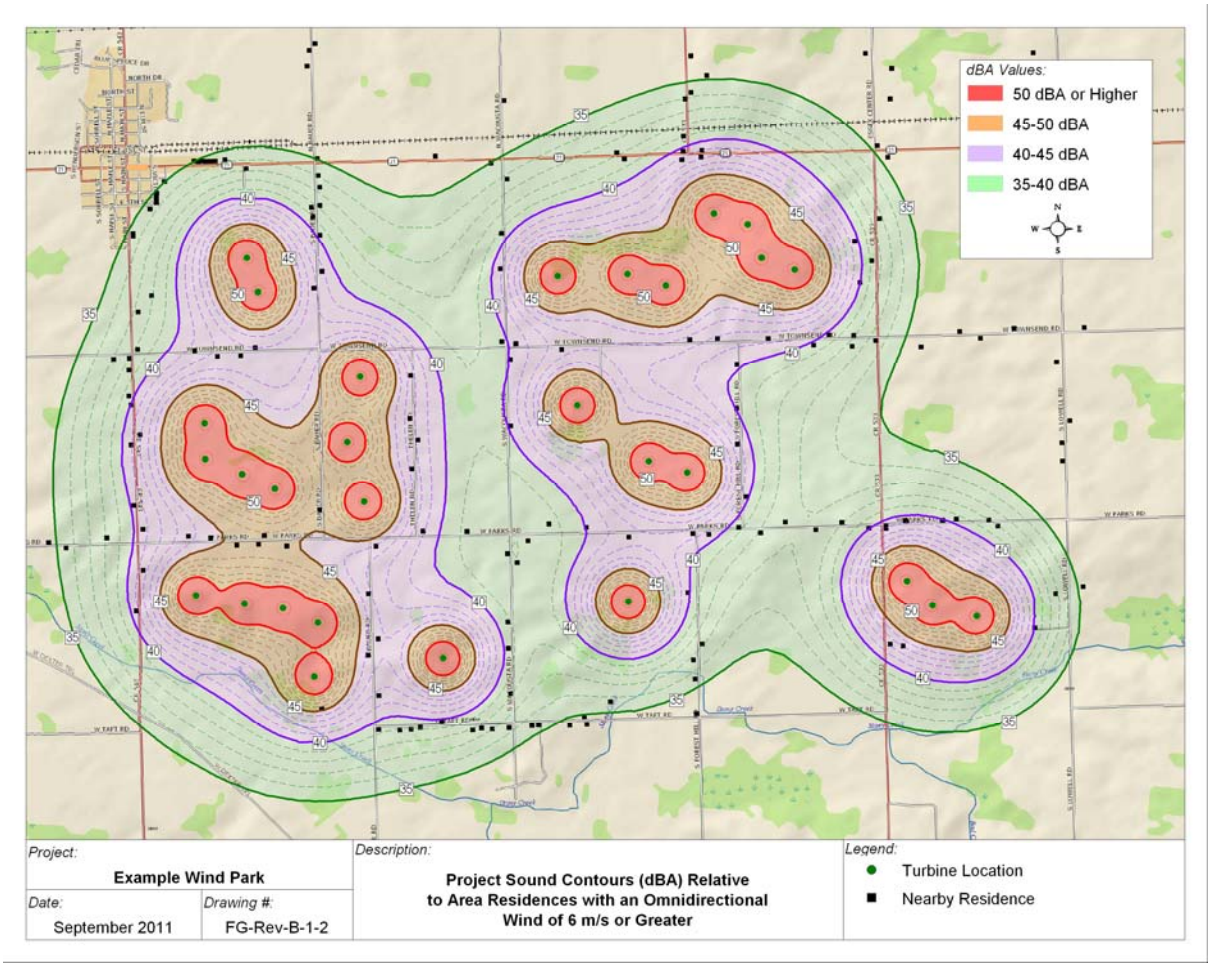


Figure 4.1.5.2 *Noise Model Plot – Example B*

In contrast to Example A, there are many homes inside of the 40 dBA sound contour in this scenario and even a few above 45 dBA, which is a common occurrence. One would have to conclude that at least a few complaints about noise would arise from this project if it were to proceed to completion in this configuration. The population density is such at this site that an optimization study should be undertaken to evaluate the feasibility of removing and relocating turbines outside of the present site area so that sound levels are substantially reduced at the homes with predicted levels of above 45 dBA and so that the number of residences above 40 dBA is dramatically diminished.

4.2 Pre-Construction Background Sound Surveys

Noise impacts can be evaluated in both absolute and relative terms. In the discussion immediately above the reaction to the example projects was estimated directly from the predicted project sound levels, neglecting background noise or essentially assuming a rural setting with generally quiet background sound levels. However, not all sites are the same and it is often prudent to perform a survey of existing conditions to establish just what the baseline sound levels are at residences in the proposed project area. In general, the audibility of, and potential impact from, any project is a function of how much, if at all, its noise exceeds the prevailing background level. A comparison between the predicted/modeled sound level from a proposed project and the actual background sound level measured in the project area under comparable wind and weather conditions gives a site-specific indication of the potential relative impact from the project.

Such a survey is not essential in all cases but is recommended when:

- Unusually high background levels are suspected (e.g. due to the proximity of a major highway, urban areas or existing industrial facilities)
- Unusually low background levels are suspected
- The project is unusually large or controversial
- There is simply a desire to carry out a complete and thorough assessment

4.3 Recommended Field Survey Methodology

The objective of a pre-construction survey is to establish what levels of environmental sound are currently being experienced at typical residences within the general project area in order to form a baseline against which the predicted sound emissions from the project can be compared. There is no need, nor would it be practical, to measure at every house. The idea is to get a set of samples that can be considered representative of the overall site area. In rural areas away from significant sources of man-made noise, it is common to find that the sound levels at all positions are generally similar indicating that background sound levels are for all intents and purposes uniform throughout the site area.

Contrary to popular belief, such a survey is *not* useful for the purpose of establishing the pre-existing environmental sound level as a baseline against which to compare the measured sound emissions from the completed project. The background sound level

varies dramatically with time, typically over a dynamic range of 30 dBA or more, depending not only on the wind speed but many other factors, such as the prevailing atmospheric conditions, the time of day, season of the year, etc., so the level measured one or two years earlier cannot be taken to accurately represent the background level present during an operational compliance test. In fact, the only valid background level is the background level occurring, literally, at the same time that the operational sound level is measured. A methodology for overcoming this seeming impossibility is discussed later in Section 5.1.

4.3.1 *Measurement Positions*

Specific monitoring positions should ideally be located at or near typical residences in the site area. It is the sound level where people actually are most of the time and especially at night that is of primary importance (rather than at property lines, for instance). Permission to set up equipment on private property is usually freely granted upon request.

If a site is largely flat and homogenous in nature (e.g. rural farmland away from any major highways, urban areas or industry) monitor positions should be selected at points that are more or less evenly distributed over the project area. In such simple cases, 6 to 8 monitoring positions are usually more than sufficient even if the project area is fairly large.

For more complex sites, where the topography is significant or where man-made noise sources already exist, more monitoring positions will generally be required with the objective of capturing sound levels at residences in each kind of setting. A "setting" is defined as an area where the prevailing environmental sound level is suspected of differing significantly from other parts of the project area. For example, houses in the bottom of ravines or valleys may experience different ambient sound levels than nearby houses on exposed hilltops. Monitors should be located at positions representative of both of these settings. Another type of unique setting might be at homes that are located directly on a major road or highway or in an urban area versus others in the project area that are in remote areas. In some cases, a wind farm already exists adjacent to the area where a new project is proposed. Measurements should be made at homes that have maximum exposure to the sound emissions from the operating turbines for comparison to measurements at residences that are remote from the existing project. The total number of monitoring positions is generally limited by equipment availability and logistical concerns but no more than about 12 to 14 positions are normally required, even for the most complex sites.

4.3.2 *Survey Duration and Scheduling*

Short duration spot samples are insufficient to capture environmental sound levels over the variety of wind and atmospheric conditions that are relevant to project operation. For example, a brief sample on a calm, quiet night is meaningless in the sense that it does not represent the background sound level that will exist on a continuous basis or during the moderately windy conditions necessary for the project to generate noise. In fact,

background sound levels in the rural areas where wind projects are most commonly sited are remarkable for their variability and substantial dependency on wind speed. It is the background sound level that occurs when it is moderately windy that is actually of interest for comparison to project sound emissions. In the very typical example below, the background sound level measured at four positions widely distributed over a proposed wind project site in the Midwest can be seen to parallel the concurrent wind speed and, moreover, to vary dramatically from 17 dBA during calm conditions to 54 dBA during windy conditions.

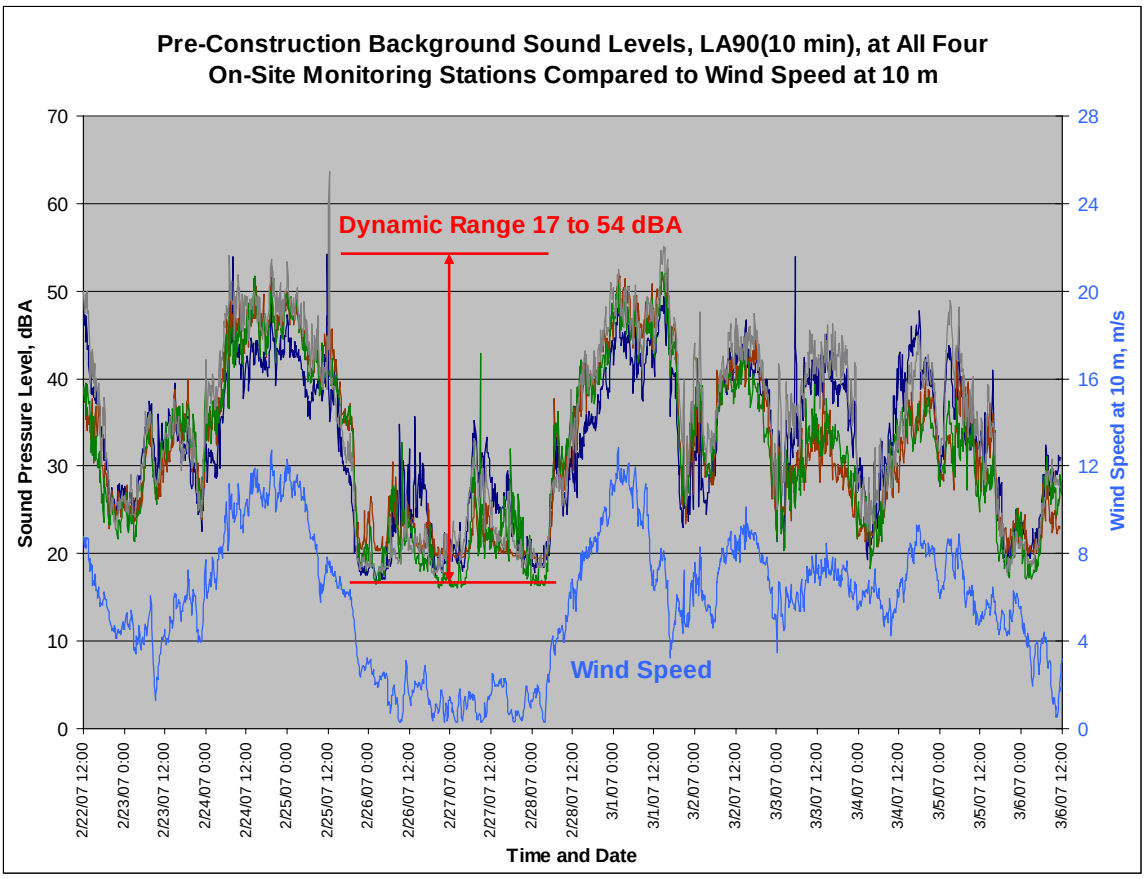


Figure 4.3.2.1

Consequently, a long-term, continuous monitoring approach is needed in which multiple instruments are set up at key locations and programmed to run day and night for a period of about two weeks or more. In essence, it is necessary to cast a wide net in order to capture sound levels during a variety of wind and atmospheric conditions and provide sufficient data so that the relationship between background noise and wind speed can be quantitatively evaluated.

Field experience suggests that an adequate range of wind speeds, from 0 to 10 m/s at 10 m above ground level, will usually be observed over any given 14 day period at most wind energy project sites, except perhaps during the low wind season at sites that might have very pronounced seasonal wind characteristics. Probably the principal reason for this observation is that this length of time is large relative to the time normally taken for

weather patterns, wind directions and general atmospheric conditions to change, which essentially ensures that the data are statistically independent, as discussed in great detail in ANSI S12.9-1992/Part 2[27]. Data independence implies that the test results can be taken to represent the longer-term acoustic situation for that area, at least for the general time of year of the test. However, if a review of the weather conditions that occurred during the survey period shows that the winds were unusually calm or if an insufficient number of data points were collected at the higher wind speeds, the survey may need to be extended for another two weeks. Low wind conditions are most commonly captured and the vast majority of the measurements will be for conditions below or just above the cut-in wind speed. High winds normally occur intermittently over a few hours or a few days separated by sometimes lengthy periods of relatively calm conditions. It may sound counterintuitive, but it is not critical to capture extremely high wind conditions, say higher than about 12 m/s at 10 m, since most complaints and issues with wind turbine noise occur during moderate or even light wind conditions, while background noise tends to predominate under very windy conditions.

As a practical matter, the instruments for such a survey are set up, started and left to run unattended for the nominal two-week test period following which they can be retrieved and downloaded. Of course, one could stay on site through the test making additional intermittent manned measurements and observations but the very high cost of such an effort would be difficult to justify, particularly since it would not necessarily guarantee a better or more definitive result than could be derived from the monitor data alone.

In terms of scheduling, it is highly preferable to conduct this type of survey during cool season, or wintertime, conditions to eliminate or at least minimize possible contaminating noise from summertime insects, frogs and birds. In addition, it is best for deciduous trees to be leafless at sites where they are present in quantity to avoid elevated sound levels that might not be representative of the minimum annual level. Human activity, such as from farm machinery or lawn care, is also normally lower during the winter. While summertime surveys can be successful they should, as a general rule, be avoided wherever possible because nocturnal insect noise, for instance, can easily contaminate the data and make it impossible to quantify the relationship between sound levels and wind speed.

In addition to seasonal concerns, it is desirable, when practical, to attempt to schedule the survey set up to just precede a predicted period of moderate or high winds. This not only ensures that the survey period will capture these winds but also creates an opportunity for manned observations and measurements to be made for a day or two to augment to the longer term monitoring survey.

4.3.3 *Instrumentation and Test Set-up*

As with any field sound survey, what equipment is used and how it is deployed must adhere to certain minimum technical standards. These requirements are generally described in numerous standards, such as ANSI S12.9-1992/Part 2[27]; however, the focus of this section is not to repeat and belabor those details but rather to point up what

adaptations need to be made for the specific application of performing general site-wide surveys for wind turbine projects. As mentioned earlier, no standard exists that can be directly used for this purpose, if only because they limit data collection to low wind conditions.

In terms of instrumentation, most environmental sound measurement standards recommend the use of Type 1 precision equipment per IEC 61672-1[28] or ANSI S1.43-1997[29] while also allowing for the use of Type 2 equipment. There is certainly no reason on technical grounds to oppose this recommendation but, from a practical perspective, it is often necessary to use Type 2 equipment for surveys of this type because of the large number of instruments needed. The normally negligible difference in technical performance between these two instrument classes is totally inconsequential within the inherently and unavoidably imprecise nature of this type of survey. It is much more important that the equipment is durable, reliable and specifically designed for extended use in the outdoors. Delicate and expensive Type 1 precision grade equipment can be unreliable in such applications or even unable to be programmed as a data logger.

Although high cost and extreme precision are not essential, the functional capabilities to statistically integrate sound levels over a user defined time period and automatically store the results are necessary. Because the on-site wind and weather monitoring towers, or met towers, normally integrate and store measurements in 10 minute increments it is convenient, if not necessary, to measure and store sound data in synchronization with the wind data collected by these towers for later correlation. It is evidently universal practice for met towers to store data 6 times an hour in 10 minute intervals that begin at the top of the hour; as in 9:00, 9:10, 9:20, etc. Consequently, sound data logging should be started using a trigger function to begin at the top of an hour and not randomly by the manual push of the start button. The timers on all instruments should be exactly synchronized to local time. Of course, all of the instruments must be field calibrated at the beginning of the survey and checked again for drift at the end of the survey.

Because this long-term survey approach involves unattended monitoring, the instrument and the microphone must be capable of withstanding damage, interference or outright destruction from rain and snow, which, among other things, means that the ground plate technique specified in IEC 61400-11 – where the microphone is laid flat in the center of a board on the ground and covered with one or more hemispherical windscreens – is not a viable option, despite its otherwise highly desirable advantage of minimizing wind-induced pseudo noise. Consequently, the microphone must be mounted above ground level and protected from wind-induced distortion by a spherical weather-treated windscreen, which normally entails a higher density foam that is hydrophobically treated to shed water (windscreens and wind-induced noise are discussed in detail later). As a general rule, a slightly lower than normal microphone height of about 1 m above ground level is preferred for this application on the premise that wind speed diminishes exponentially with decreasing elevation theoretically going to zero at the surface, or boundary layer. To illustrate this, the nominal wind speed profile, or shear gradient, per Eqn. (7) in IEC 61400-11 is illustrated below in Figure 4.3.3.1 for a common turbine

operating condition where the wind speed is 6 m/s at the standard elevation of 10 m above ground level.

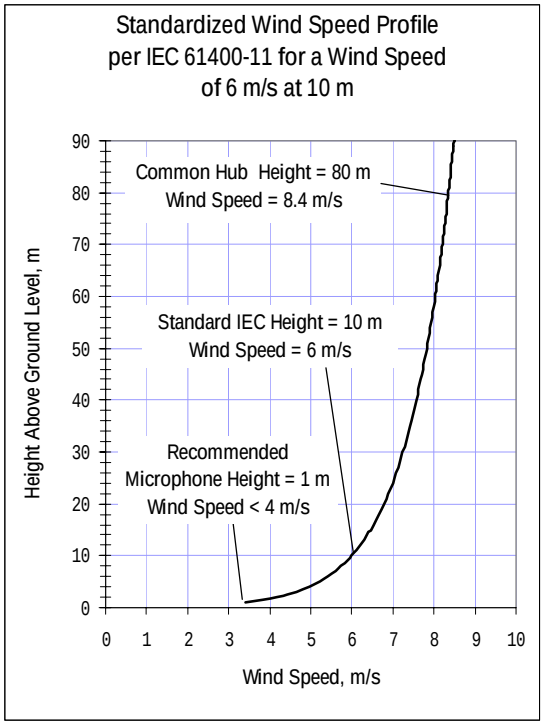


Figure 4.3.3.1

For these moderate wind conditions, the wind speed at a 1 m microphone height would be less than about 3 or 4 m/s, which as shall be seen later, means that distortion from wind blowing through the windscreen is of little or no consequence with respect to the A-weighted sound level so long as an extra large windscreen is used (typically 7" in diameter, as a minimum).

In addition to arranging for the microphone to be about 1 m off the ground so that it is not adversely affected by precipitation, it is also necessary to keep the instrument itself dry and secure in a waterproof case, which is best mounted above the ground on a fencepost, utility pole or other support.

While the microphone can be remotely connected to the instrument with a cable and independently supported, another option is to use a self-contained system where the microphone is attached to the instrument case with a rigid boom to hold the microphone away from the box and the entire assembly is mounted 1 m above ground level with a strap as shown, for example, in Figure 4.3.3.2. While there is nothing wrong with supporting the microphone separately on a tripod there is a tendency, unique to wind turbine survey work, for tripods to blow over, even after being weighted down and/or firmly staked to the ground. The use of temporary metal fence posts to support either the microphone alone or the entire system is a more reliable option and is sometimes the only option in places where there are no existing supports, such as in open fields.



Figure 4.3.3.2 *Typical Integrating Sound Monitor with 7" Weather-treated Windscreen*

In addition to sound level meters it is also advisable to set up at least one temporary weather station at the most exposed measurement position in order to measure the wind speed at microphone height and other parameters such wind direction and rainfall. All weather data should also be logged in 10 minute increments for later correlation to the sound data.

4.3.4 *Measurement Quantities*

For a background survey of this type the principal quantity of interest is the L_{A90} statistical measure, which is the A-weighted sound level exceeded 90% of the measurement interval (10 minutes in this case). What this means is that the sound level is higher than the L_{A90} value most of the time and, conversely, that the L_{A90} level represents the near-minimum sound level for each interval. It essentially captures the momentary, quiet lulls between sporadic noise events, like cars passing by, and, as such, is a conservative measure of the environmental sound level.

The average A-weighted sound level, or L_{Aeq}, which is the fundamental metric for highway noise surveys and the calculation of the Day-Night Average Level, L_{dn}, is unsuitable for wind turbine background surveys in rural areas because this level is extremely sensitive to contaminating noise events, such as from occasional traffic, planes flying over or dogs barking – things that cannot be relied on to be consistently present and available to potentially mask project noise on a permanent basis. The L_{A90} measure, on the other hand, automatically excludes these events for the most part and essentially defines the true "background" noise floor.

4.4 Analysis and Interpretation of Results

4.4.1 *Data Analysis and Wind Speed Correlation*

At the completion of the survey the L_{A90} sound levels measured at all positions should be plotted together to evaluate their consistency and to determine if the levels in different settings should be segregated. For example, if the sound levels at sheltered valley locations are consistently lower than measurements on higher ground then the data should be analyzed separately to develop typical background levels for each setting. Somewhat surprisingly, the need for this kind of separate treatment is rare and the much more common result is for the sound levels at all of the positions to be generally similar in magnitude at any given time with each generally following the same temporal trends and intertwining with each other. As a typical example, the as-measured L_{A90} levels at 7 positions spread over a fairly large site in Southern Minnesota are shown below.

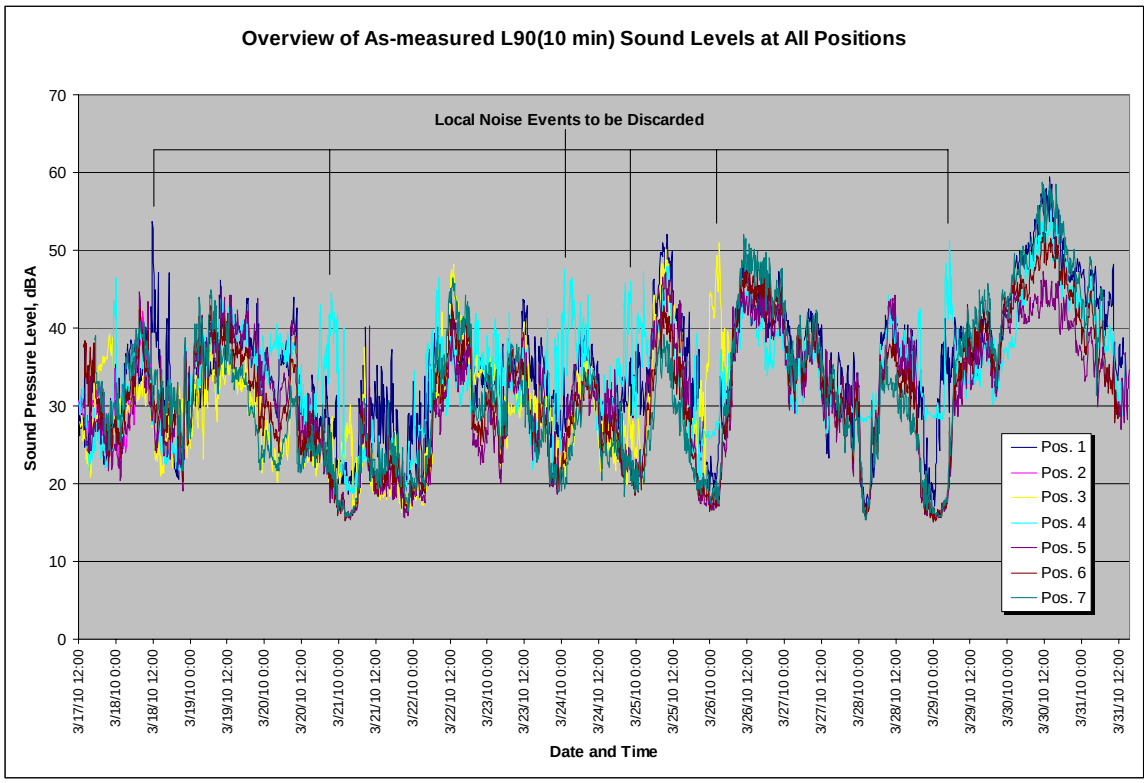


Figure 4.4.1.1

All positions follow each other and there is no one position that is consistently higher or lower than the others. Since these positions are miles apart from each other one would not expect exact agreement yet the levels are remarkably similar indicating that the environmental sound level over the entire site are is more or less uniform (sometimes termed a "macro-ambient"). If obvious contaminating events - those occurring at only one position - are discarded (as noted in the figure) the arithmetic average of the remaining data points can reasonably be considered the typical sound level over the site area. However, the question becomes: what is the sound level? The level varies

substantially with time from almost complete silence (17 dBA) to nearly 60 dBA. The background level is obviously not a single number. The reason for this variation becomes clear if the average site-wide sound level is compared to the concurrent wind speed (Figure 4.4.1.2).

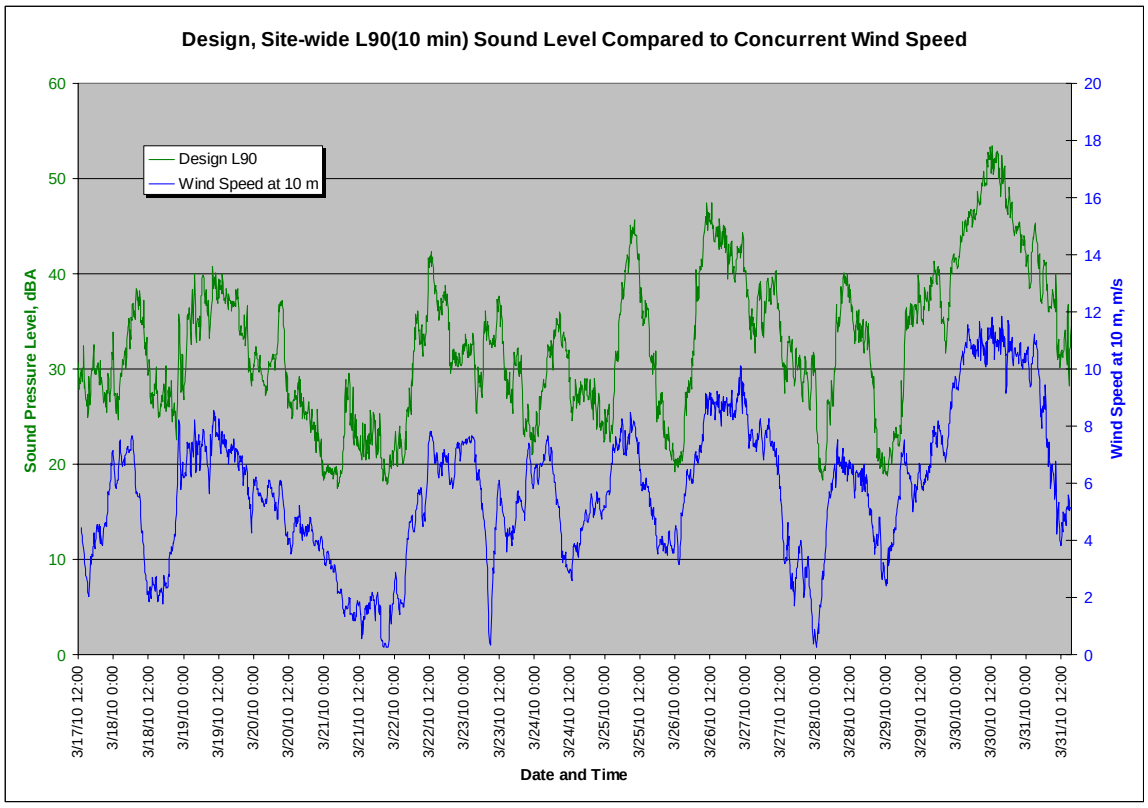


Figure 4.4.1.2

Clearly, the sound level in this area is driven by wind-induced sounds; in this case, mostly grass or crops rustling. Consequently, the sound level is almost entirely a function of the wind speed occurring at any given moment. This relationship can be quantified by re-plotting the sound levels in Figure 4.4.1.2 as a function of wind speed (normalized to a standard height of 10 m per Eqn (7) in IEC 61400-11).

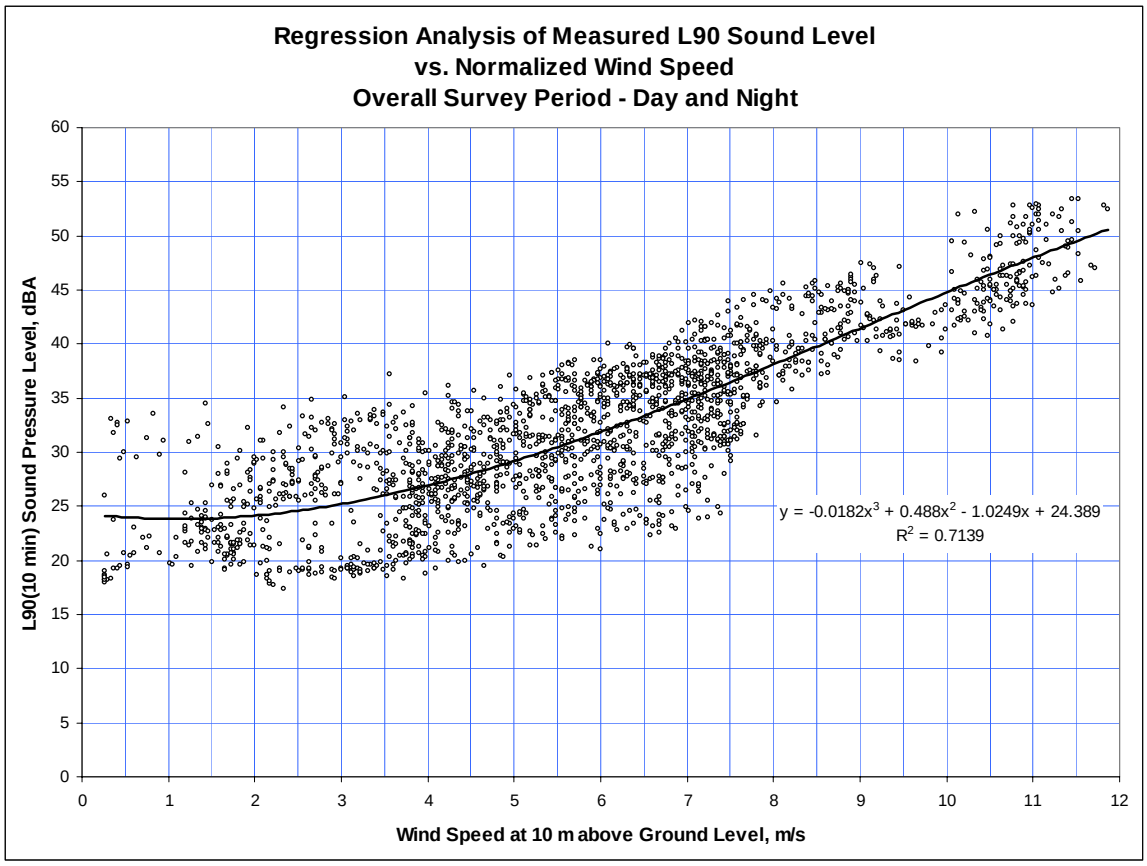


Figure 4.4.1.3

The central trendline through the data gives the mean L_{A90} sound level for any particular wind speed – at least in terms of the overall survey period.

It is important to point out in this context that, although the wind speed correlated to the sound data is the normalized value at the IEC standard elevation of 10 m, the measurement is actually taken at the top of the met tower, usually 60 m (197 ft) above ground level. Thus, the wind speed associated with turbine operation (not far below hub height) is directly correlated to the sound level measured near ground level; where the wind speed may well have been negligible. In other words, Figure 4.4.1.3 is *not* showing the relationship between the sound level and wind speed at the measurement position, as is quite often supposed.

4.4.2 *Daytime vs. Nighttime Levels*

Since nighttime conditions are of the most relevance with respect to potential disturbance from project noise, the data should be broken down into daytime (7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) levels to see if it is significantly quieter at night - something that is not always particularly apparent in the level vs. time data (Figure 4.4.1.1). In this instance, the nighttime levels (Figure 4.4.1.4) are substantially quieter than during the day (Figure 4.4.1.5), particularly, in the vicinity of 6 m/s, which is usually the point where wind turbines first start to generate significant noise but the background level is typically

still rather low thereby maximizing the potential audibility of project noise. In these examples, the mean background level for 6 m/s wind conditions during the day is 34 dBA while the nighttime level is about 28 dBA. Both of these levels are extremely quiet, but 28 dBA is so low that any potential masking from background noise can essentially be neglected as insignificant.

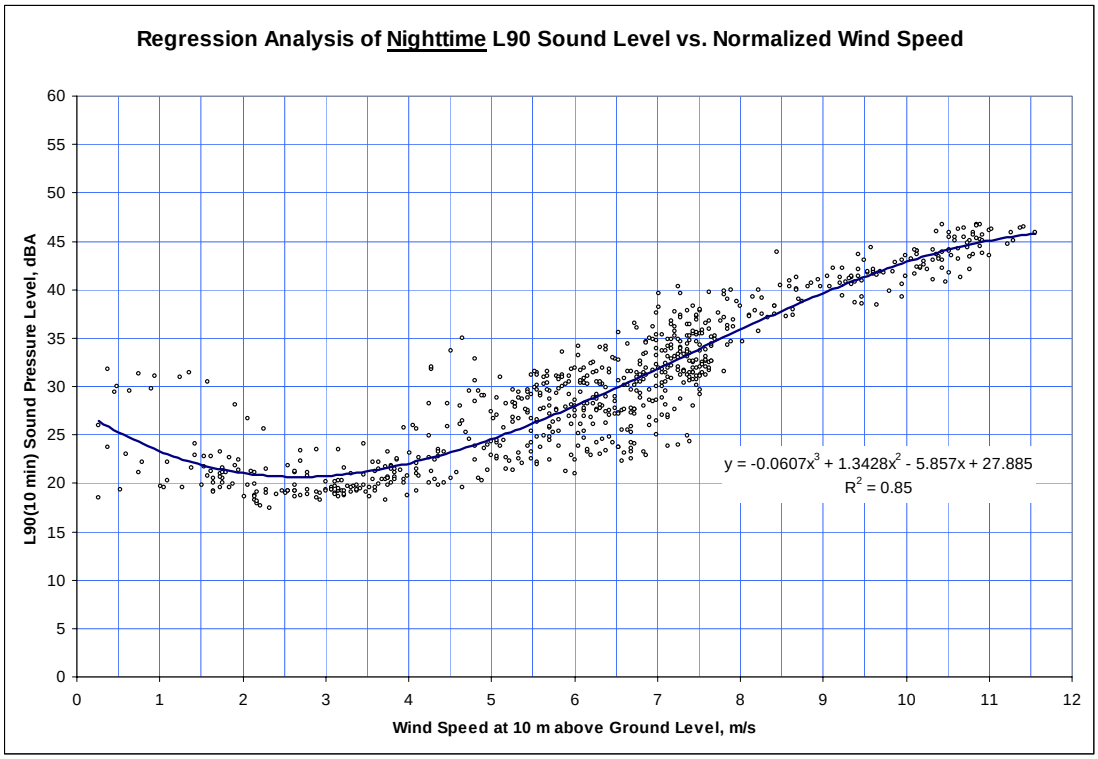


Figure 4.4.1.4

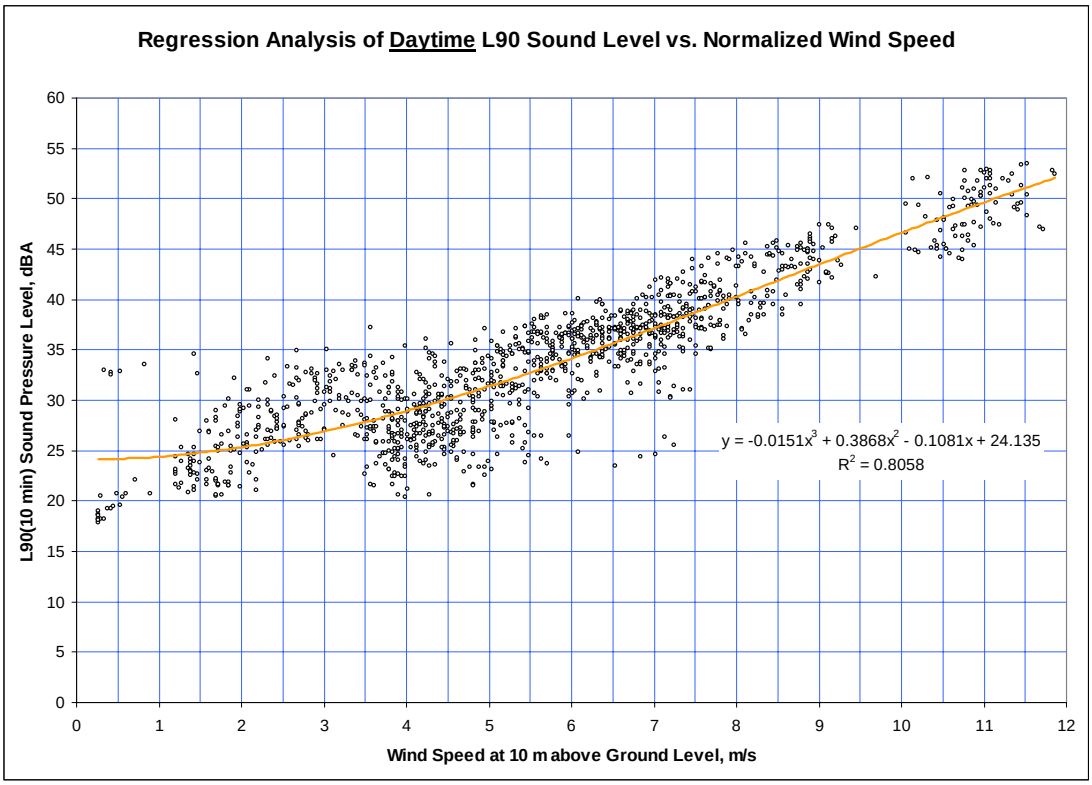


Figure 4.4.1.5

4.4.3 *Assessing the Potential Impact*

The sound levels measured in this survey, especially at night, indicate this site is an extremely quiet rural environment where any masking from wind-induced background noise can effectively be disregarded during moderate wind conditions (4 to 7 m/s). Under high wind conditions, say around 10 m/s, background noise is in the mid-40's dBA irrespective of time of day and therefore will act to partially obscure project noise, but during low wind conditions when the project is operating at low load an adverse impact can be expected unless the mean project sound level is kept to a relatively low level at residences. In this instance, it would be advisable to strictly design the project so that all residences are predicted to have average sound levels no higher than 40 dBA.

In general, background survey results may be used to establish a very rough impact threshold of 5 dBA over the ambient when the nighttime L_{A90} is about 35 dBA or more under what is usually the critical wind speed of 6 m/s. For example, if the measured level is 40 dBA then little adverse reaction might be expected from project levels up to 45 dBA (predicted with the project operating during comparable 6 m/s wind conditions). This 5 dBA increase metric does not hold for very low background levels (<35 dBA) because the background sound level and the project level both become so low as to be insignificant in absolute terms. If the background were 10 dBA, for instance, there would be no need to design a project to not exceed 15 dBA – both levels represent almost complete silence and are inconsequential. For low background situations like the

example discussed above the outcome of the survey would be to set a firm upper limit of 40 dBA at residences. In terms of a potential noise impact, a low background level combined with predicted project levels of more than 40 dBA at numerous residences would be an undesirable situation likely to lead to complaints.

Although 6 m/s may be assumed in most cases to be the critical wind speed - i.e. the point where turbine noise is likely to be loudest relative to the amount of background noise available to potentially obscure it – the site-specific critical wind speed may also be calculated by comparing the sound power levels of the particular turbine model planned for the project with the L_{A90} background levels actually measured at the site. The critical condition corresponds to the point where the simple differential between these two values is maximum, as illustrated in the following example.

Table 4.4.3.1 *Comparison of Turbine Sound Power Levels to Measured Background Levels to Determine Critical Wind Speed*

Wind Speed at 10 m, m/s	Measured Overall L_{90}, dBA	Turbine Sound Power Level, dBA re 1 pW[c]	Differential
4	27	95	68
5	29	99	69
6	**32**	**102**	**70**
7	35	104	69
8	38	104	66
9	41	104	63
10	45	104	59
11	48	104	56

In this case (based arbitrarily on the data in Figure 4.4.1.3) the maximum differential of 70 occurs at 6 m/s – meaning that the sound emissions from the turbine are the highest at this particular point relative to the background level indicating that project noise would theoretically be most audible under these conditions. Ironically, the maximum audibility point does not usually correspond to the wind speed when the turbine first reaches its maximum noise emission point (in this example 7 m/s and a sound power level of 104 dBA re 1 pW).

As a side note, this analysis illustrates one of the reasons why it is beneficial to normalize the met tower wind speed data to 10 m; namely, because wind turbine sound power levels are expressed as a function of wind speed at 10 m above grade (and not at hub height). Consequently, the background sound levels and the turbine sound levels are all compared on an equal footing.

[c] The fundamental unit of sound power is Watts and sound power levels are expressed with reference to 1 picoWatt, or 10^{-12} W. By convention this reference is explicitly stated to help distinguish power levels from pressure levels, which are measured in terms of Pascals.

5.0 Measuring Wind Turbine Sound Emissions

5.1 Project-wide Compliance Testing

5.1.1 *Historical Approaches*

In general, it has been difficult, historically, to devise or settle on a completely satisfactory methodology for testing newly completed wind projects for the purpose of determining whether or not they are in compliance with permit or regulatory conditions. One of the principal stumbling blocks has generally been accounting in some meaningful way for background noise, since the total measured sound level at the typically substantial distances to residences and, therefore, the point of measurement, commonly contains a very prominent background component that cannot be disregarded without causing the result to be erroneously high. It is, of course, the project-only sound level and not the total sound level that is limited by regulations. Consequently, it is the project-only sound level that is sought in such surveys.

Existing guidelines and standards that mention the topic of compliance testing at all do not lay out or detail test procedures that are entirely satisfactory in this and other respects. For example, the often beleaguered[30] ETSU-R-97 report *The Assessment and Rating of Noise from Wind Farms*[31] published by the Department of Trade and Industry in the U.K. addresses the issue of background noise in one sentence, quoted below, by suggesting simply that one might want to measure operational turbine noise at night.

> To minimize the effects of extraneous noise sources it may be necessary to perform these measurements during night-time periods when other human and animal activity noise sources are likely to be at a minimum.

This approach, which involves measuring only for a relatively short period of time (20 to 30 $L_{A90,\ 10\ min}$ samples), is connected with the idea of taking measurements only at, or close to, a specific critical wind speed identified from "monitoring", carried out in an unspecified manner, and correlated to logged observations by complainants as to when the "noise is most intrusive" [(ibid)]. In short, the idea is for the test engineer to be physically at the location and ready to take measurements when the wind conditions that result in maximum noise are occurring - so long as those conditions are happening at night on a night when the background sound level is negligible (i.e. roughly 10 dBA or more lower in magnitude than the turbine sound level). As might be imagined, the unfortunate reality is that the probability of all these things coming together at the same time is miniscule. In particular, it is typically difficult, for a number of reasons, for a test engineer to schedule a site visit to coincide with a particular wind speed or direction.

In general, the notion of being on hand to observe and measure wind turbine noise when it is at its loudest may sound reasonable on paper but it is seldom practical to actually do it.

Another approach to the issue of background noise that has been used, for example in the New Zealand Standard NZS 6808:1998 *Acoustics – The assessment and measurement of*

sound from wind turbine generators[32], is to measure the background level at one time, say, prior to construction or start-up, and the operational noise from the project at another time - and then subtract the two to derive the project-only sound level. While this is often thought of or suggested as a reasonable approach, the problem is that both the background and wind turbine sound levels are extremely dependent on circumstances that vary significantly with time in both the short and long-term. The two sounds are highly specific not only to the prevailing wind speed at a particular time but also to factors such as the stability of the wind (whether it's gusty or constant in nature, for instance), wind direction, shear gradient, thermal gradient, time of day and time of year. Moreover, the background level is also exclusively influenced by foliage (bare trees vs. leafed out trees, for example), insects, frogs, distant or nearby traffic, farm equipment and a myriad of other human activities that occur sporadically and unpredictably. Consequently, a background sound level measured days, months or years before can't be used with a tremendous amount of confidence to correct a later measurement of operational noise, even if both have been normalized to similar wind speed conditions, because so many other unquantifiable factors may have had a hand in shaping the final results. What is needed, of course, is the background sound level that would have existed at that particular time and at that place if the project had not been operating.

This latter objective can sometimes be essentially realized by using the technique of temporarily shutting down, or parking, the nearest turbines to a measurement position, if not the entire project. While this technique has its applications, which will be discussed later, it is not usually a practical method that can be used for a general site-wide compliance test. Widespread or complete shutdowns would be required repeatedly over a variety of wind speed conditions and times of day to get even a minimally complete set of usable background levels.

Thus, there are certain impracticalities associated with the few existing guidelines, standards or common practices that deal with the testing of operational noise from wind turbine projects.

5.1.2 *Test Methodology*

The suggested methodology outlined below, which has been developed over time through field experience on a variety of wind projects, does not purport to completely solve the problems of background noise and capturing the periods of maximum noise, among other things, but it has been found to work very well in numerous field applications.

5.1.3 *Survey Duration and Scheduling*

In order to overcome the problem of being on hand to take short-duration measurements when conditions might favor noise generation at the source and/or sound propagation from the turbines to typical receptor points, a long-term, continuous monitoring approach is needed in which multiple instruments are set up at key locations and programmed to run day and night for a period of about two weeks or more. In essence, it is necessary to capture sound levels during a variety of wind and atmospheric conditions; something that

is extremely difficult to achieve by taking intermittent manned samples, which amount to static snapshots of a dynamic situation.

Field experience suggests that an adequate range of wind speeds, from 0 to 10 m/s at 10 m above ground level, will usually be observed over any given 14 day period at most wind energy project sites, except perhaps during the low wind season at sites that might have very pronounced seasonal wind characteristics.

As a practical matter, the instruments for such a survey are set up, started and left to run unattended for the nominal two-week test period following which they can be retrieved and downloaded.

In terms of scheduling, it is highly preferable to conduct this type of survey during cool season, or wintertime, conditions to eliminate or at least minimize possible contaminating noise from summertime insects, frogs and birds. In addition, it is best for deciduous trees to be leafless at sites where they are present in quantity to decrease this source of wind-driven background noise and maximize the signal to noise ratio. Human activity, such as from farm machinery or lawn care, is also normally lower during the winter. While summertime surveys have been successful they should, as a general rule, be avoided wherever possible because nocturnal insect noise, for instance, can easily render the project sound level indeterminate at some or all of the measurement positions. If measurements are required during the summer, and they often are for reasons of project scheduling, high frequency contamination can be analytically factored out by taking the measurements in octave or 1/3 octave bands and correcting the spectra, as will be discussed later in greater detail.

In addition to seasonal concerns, it is desirable; when practical, to attempt to schedule the survey set up to just precede a predicted period of moderate or high winds. This not only ensures that the survey period will capture these winds but also creates an opportunity for manned observations and measurements to be made for a day or two to augment to the longer term monitoring survey. There is generally nothing to observe or measure at a wind turbine site when the winds are calm, so if one can be on site with the proper equipment just before a windy period useful short-term measurements can probably be made that can later be viewed within the context of the long-term monitor results for that time period.

As an alternative or supplemental approach, another opportunity for these supplemental manned observations can sometimes be arranged by coordinating the instrument retrieval visit with a predicted windy period. The specific end date for the survey is usually flexible, although instrument battery life is normally the limiting factor. The principal danger in carrying out manned measurements just before the end of a survey, however, is that all of the long-term monitors may not still be recording due to power supply issues or any number of other lamentable and sometimes comical things, such as tampering, weather damage or the removal of the windscreen by livestock.

5.1.4 *Test Positions*

The test positions should be selected to capture data at a number of potentially sensitive receptors (usually non-participating and participating residences within or near the site area) or other relevant points of interest, where maximum project sound levels might be expected either from modeling or a simple inspection of the site plan. In just about every case, it is not practical or even possible to establish a monitoring station at every house in the vicinity of a project so it is necessary to carefully select a limited but adequate number of sites that are representative of the worst-case exposures at potentially sensitive receptors in all relevant settings. Examples of specific settings would be: homes in sheltered valleys below ridge top turbines; homes on high, open ground with exposure to the wind and nearby project turbines; homes in generally flat open country with turbines in multiple directions; homes in wooded area; homes on the outer edge of a project area, etc. Because every site is unique the number of monitoring stations required to adequately evaluate project noise will vary but the general concepts are to reasonably account for different settings, to cover a number of points were maximum project sound levels are likely to occur at residences and to cover the entire project area with a generally even but somewhat random distribution. Adding one or two deliberately random positions can help increase the statistical independence of the data and avoid inadvertent bias. For sparsely populated sites in open and uniform farm country only about 4 or 5 on-site monitors might be needed while at more densely populated sites with more complex topography the number of monitoring stations would only be limited by the quantity of equipment reasonably available to the test engineer either from in-house stock or outside rental. Realistically, it is seldom possible to gather enough equipment for more than about 10 to 14 on-site monitoring points, but that is normally enough. A typical survey at a fairly large project site with numerous residences intermixed with the turbines might call for about 10 positions at receptors within the project area.

As mentioned above, the general objective is to capture sound levels throughout the site area at key receptors in all distinct settings within the project area. In addition, it is commonly necessary and desirable to establish a measurement position at all homes where complaints or concerns about noise have been expressed to the operations staff. In these instances, it is sometimes possible to enlist the help of residents by having them try to keep a date and time log of when the noise becomes particularly noticeable or unusually loud or when other non-project sounds are present; for example, from lawn moving, farm activity, etc. When this is actually done the comments can provide some valuable insights that help explain and identify peaks in the recorded sound levels.

It is often assumed that project noise is of no concern to project participants who were, and presumably still are, favorably disposed to the project and are receiving lease royalties for units on their land; however, experience at a number of sites suggests that this is not always the case largely due to the confluence of two factors: (1) these residences are typically the closest ones to turbines (sometimes only a few hundred feet away) and (2) the actual sound levels from these nearby units can turn out to be substantially louder than they expected them to be or they were led to believe. Consequently, monitoring at the homes of project participants in response to complaints

is fairly common – even though participants are often, but not always, technically exempt from ordinance or permit noise limits.

It is usually best to start the site selection process a week or two in advance of the actual survey by circling proposed measurement areas on a site map or sound contour plot and submitting this to operations personnel at the site for their input on who, within or near each designated area, might be willing to host a sound monitor at their house and where else, outside of these proposed areas, it might be also be desirable to measure (at complaint locations, for instance). The objective of this preparatory review is to obtain approval and permission from homeowners to set up equipment on their property prior to arrival. Although it is desirable to inspect the proposed locations and make a judgment as to their suitability in person, attempts to arrange for permission on the day of the survey are often unsuccessful due to the simple fact that people are not at home and cannot be reached. Calling ahead usually settles the issue before the equipment is shipped to the site. Setting up the equipment in the rear yard of a house where permission has been obtained generally ensures that the equipment will still be there upon returning at the end of the survey, that the equipment won't be interfered with and that it can be minimally attended to, if necessary (replacing the windscreen after the family dog has run off with it, for example). Positions that are not at anyone's house, such as on utility poles along the public right-of-way, are sometimes necessary to collect data at strategic locations without a suitable host, but they do not have any of these advantages and, in fact, the risk of theft or tampering is uncomfortably high.

In terms of the specific placement of the monitor at each position, it should be located in an area representative of but away from the house, or any other building with large reflective surfaces, and that is not prone to frequent activity or contaminating local noises, such as from air conditioning units, milking machines at dairy farms or flowing streams or rivers.

As a final note on placement, it is best to avoid using fences or posts to mount the monitor or microphone in areas where livestock or other domestic animals may be able to get at the equipment during the survey. Microphone windscreens are evidently of keen interest to cows, horses and dogs, among others.

5.1.5 *Background Noise*

On the important issue of background noise, an approach that has worked well in a number of field applications is to set up a number of monitoring stations outside of the project area in settings similar to those at the on-site monitor positions. Of course, considerable judgment is involved in selecting these positions but in an ideal situation of, say, an isolated project in open farm country that is largely uniform in character both within and beyond the project area one would want monitors at least 1.5 to 2 miles from the perimeter of the project (nearest turbines) in the four cardinal directions. The locations should be far enough away that project noise is negligible and yet close enough that they are reasonably representative of the site area. At the end of the survey the off-site positions can then be evaluated for consistency. If the levels are generally similar,

and, somewhat surprisingly, this is usually the result, the average can be taken as a time history record of the background sound level that probably would have existed within the site area and then used to correct the on-site measurements taken, importantly, at the same time under identical environmental conditions.

Figure 5.1.5.1 below is an example from a site in the Eastern United States where the landscape is rural and generally homogenous in nature within the project area and for some distance beyond it in terms of topography (rolling hills), vegetation (a mix of farm fields and wooded areas) and population density (farms and residences scattered more or less uniformly over the site area). The 80 or so 1.5 MW turbines are spread throughout a roughly 20 sq. mi. project area on numerous parcels of private land and thoroughly intermixed with the residences in the area. Proxy background measurement positions were set up about 1.5 miles beyond the perimeter of the turbine array to the northwest, east and south of the project (a neighboring wind project to the west prevented measurements in that direction) at locations that were similar in character to the various settings near on-site residences: one was on an open and exposed hilltop, another was at the edge of a field with nearby trees and a third was essentially in a forested area. The expectation was that there might be a consistent difference between these different positions – with the sheltered forest location being quieter than the windy hilltop, for instance – in which case background corrections for a particular setting would be applied to on-site measurements at positions with comparable settings. However, as can be seen from the figure, the levels at all three locations, each many miles from the others, were largely the same at any given time and, perhaps more significantly, no one position is consistently higher or lower than the others. Consequently, the arithmetic average of all three, with the site area physically lying between them, can be taken as a reasonably reliable estimate of the on-site background level at any particular time that accounts for the specific wind speed, direction, time of day and atmospheric conditions prevailing during that 10 minute period.

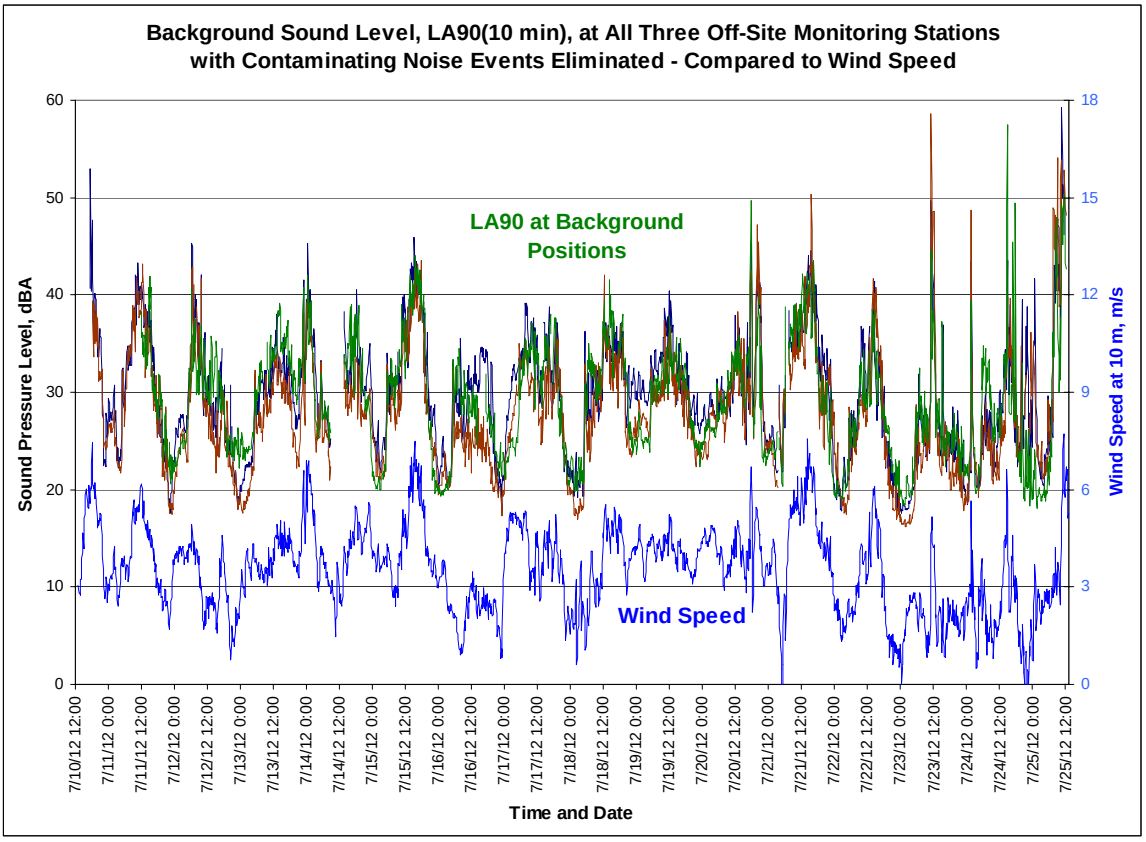


Figure 5.1.5.1 *Measured Background Sound Levels at Three Off-Site Proxy Positions*

The data in Figure 5.1.5.1 have been edited to remove noise spikes that were observed only at one position and not at any others, indicating a contaminating local noise event that is not representative of the area as a whole. Spikes were also deleted (from both the on-site and background data) if there were no concurrent spike in wind speed, even if they may have occurred at multiple locations, on the premise that the noise was not associated with the turbines and may have been due to thunder, rain, a helicopter flyover or some other area-wide noise event.

The results shown in the example above are not unique to that site and a similar consistency between the off-site proxy location sound levels has been observed at a number of other projects in rural areas even though the background monitors are deliberately set up in diverse settings. Fortunately, for the purpose of estimating simultaneous background sound levels, most wind projects are located in rural areas but, of course, not all of them are and other situations exist. In urban settings or near major highways the background sound is no less important, in fact more so, but its dependence on wind and atmospheric conditions is greatly diminished, if not relegated into complete insignificance. In such cases, the proxy background technique is still theoretically viable although the selection of background positions that are representative of receptors potentially affected by project noise becomes highly specific to the circumstances at each receptor. In the case of a highway, for instance, one might try to find a background position that is the same distance from the roadway as the actual point of interest and similar in all other ways but far enough from any turbines that they are undetectable. In

this kind of a complicated situation where the background level is more dependent on man made noise than natural, wind-induced sounds it may be necessary to perform a pre-construction survey at the key receptors near turbines and at a number of candidate background positions to evaluate the validity of the proxy locations before the project turbines become operational.

5.1.6 *Sound Test Equipment and Set up*

As with any field sound survey, what equipment is used and how it is deployed must adhere to certain minimum technical standards. Most environmental sound measurement standards recommend the use of Type 1 precision equipment per IEC 61672-1[28] or ANSI S1.43-1997[29] while also allowing for the use of Type 2 equipment. There is certainly no reason on technical grounds to oppose this recommendation but, from a practical perspective, it is often necessary to use Type 2 equipment for surveys of this type because of the large number of instruments needed. The utterly intangible difference in technical performance between these two instrument classes is totally inconsequential within the inherently and unavoidably imprecise nature of this type of survey. It is much more important that the equipment is durable, reliable and specifically designed for extended use in the outdoors.

Although high cost and extreme precision are not essential, the functional capabilities to statistically integrate sound levels over a user defined time period and automatically store the results are necessary. Because the on-site wind and weather monitoring towers, or met towers, normally integrate and store measurements in 10 minute increments it is convenient, if not necessary, to measure and store sound data in synchronization with the wind data collected by these towers for later correlation. It is evidently universal practice for met towers to store data 6 times an hour in 10 minute intervals that begin at the top of the hour; as in 9:00, 9:10, 9:20, etc. Consequently, sound data logging should be started using a trigger function to begin at the top of an hour and not randomly by the manual push of the start button. The timers on all instruments should be exactly synchronized to local time or to the project's SCADA control system clock, if it is different from the actual time, which it often is.

Of course, all of the instruments must be field calibrated at the beginning of the survey and checked again for drift at the end of the survey.

Because this long-term survey approach involves unattended monitoring, the instrument and the microphone must be capable of withstanding damage, interference or outright destruction from rain and snow, which, among other things, means that the ground plate technique specified in IEC 61400-11 – where the microphone is laid flat in the center of a board on the ground and covered with one or more hemispherical windscreens – is not a viable option despite its otherwise highly desirable advantage of minimizing wind-induced pseudo noise. Consequently, the microphone must be mounted above ground level and protected from wind-induced distortion by a spherical weather-treated windscreen, which normally entails a higher density foam that is hydrophobically treated to shed water (windscreens and wind-induced noise are discussed in detail later). As a

general rule, a slightly lower than normal microphone height of about 1 m above ground level is preferred for this application on the premise that wind speed diminishes exponentially with decreasing elevation theoretically going to zero at the surface, or boundary layer.

For these moderate wind conditions, which are often when turbine noise tends to be most prominent relative to the background level, the wind speed at a 1 m microphone height would be less than about 3 or 4 m/s, which as shall be seen later, means that distortion from wind blowing through the windscreen is of little or no consequence with respect to the A-weighted sound level.

In addition to arranging for the microphone to be about 1 m off the ground so that it is not adversely affected by precipitation, it is also necessary to keep the instrument itself dry and secure in a waterproof case, which is best mounted above the ground on a fencepost, utility pole or other support.

While the microphone can be remotely connected to the instrument with a cable and independently supported, another practical option is to use a self-contained system where the microphone is attached to the instrument case with a rigid boom to hold the microphone away from the box and the entire assembly is mounted 1 m above ground level with a strap. While there is nothing wrong with supporting the microphone separately on a tripod there is a tendency, unique to wind turbine survey work, for tripods to blow over, even after being weighted down and/or firmly staked to the ground. The use of temporary metal fence posts to support either the microphone alone or the entire system is a more reliable option and is sometimes the only option in places where there are no existing supports, such as in open fields.

5.1.7 *Weather Stations and Wind Speed Monitoring*

In addition to the sound monitors it is also advisable to establish at least one temporary weather station at the sound monitoring position with the most exposure to wind. The primary reason for this station is to measure the maximum wind speed at microphone height (about 1 m) for use in correcting the measured sound data for wind-induced distortion as described in a later section. Wind speed at 1 m, direction and rainfall are the primary parameters to be recorded by this station, or others set up in other settings as appropriate, such as at a sound monitoring position sheltered from the wind by the local terrain (to demonstrate, for instance, that wind-induced distortion is negligible at such locations). This data should be integrated and stored in 10 minute blocks in synchronization with the sound monitors.

This temporary anemometer at 1 m above ground is solely there to evaluate microphone wind exposure and it is the on-site met tower anemometers, usually at 50 to 80 m above ground level, that should be used to correlate the measured sound levels at ground level to the wind speed essentially experienced by the turbine rotors. Turbine nacelle anemometers scattered throughout the site may also be used to determine wind speed, but this is somewhat less desirable because a free field correction usually needs to be applied

to this data to account for the energy extracted from the wind by the rotor just upstream of the wind speed sensor.

It is customary to normalize mast top or nacelle wind speeds to a standard elevation of 10 m above grade per IEC 61400-11. It is this result that is compared to the measured sound levels.

5.1.8 *Measurement Quantities and Parameters*

The objective of a compliance survey is to extract the project-only sound level from the total soundscape and compare that result to the permissible limit. As such, the principal challenge is identifying and eliminating contaminating noises that are unrelated to the project over many days and thousands of measurements. If it were practical to take a manned sample for 20 minutes, removing spurious noises by pausing the instrument or discarding contaminated subsamples, and declare the result as the performance of the project it would be a trivial matter; however, over a relatively long time period of unattended monitoring it is necessary to use the L_{A90} statistical measure to generally perform this function in an automated manner, since it captures the consistently present sound level during relatively quiet periods between common interfering and identifiable noise events like cars passing by or planes flying over. A 10 minute sampling duration has been found to work very well since it allows direct correlation with met mast wind speed data and is generally short enough that fairly rapid changes in project noise are captured.

The use of the average, or $L_{Aeq,\ 10\ min}$, sound level or a finer time resolution of, say, 1 minute come to mind as alternatives to the L_{A90}, but these approaches have their own serious drawbacks. If the L_{Aeq} is used to measure at on-site positions with the idea of better quantifying turbine sound levels, then the L_{Aeq} measured at the proxy background positions must also be used as an apples-to-apples correction factor. But the L_{Aeq} is often completely unusable for this application. As an example, multiple statistical measures were recorded at the off-site background measurement positions previously mentioned in connection with Figure 5.1.5.1, including the L_{Aeq}. Figure 5.1.8.1 below shows the average L_{A90} and L_{Aeq} levels measured at all three locations compared to wind speed.

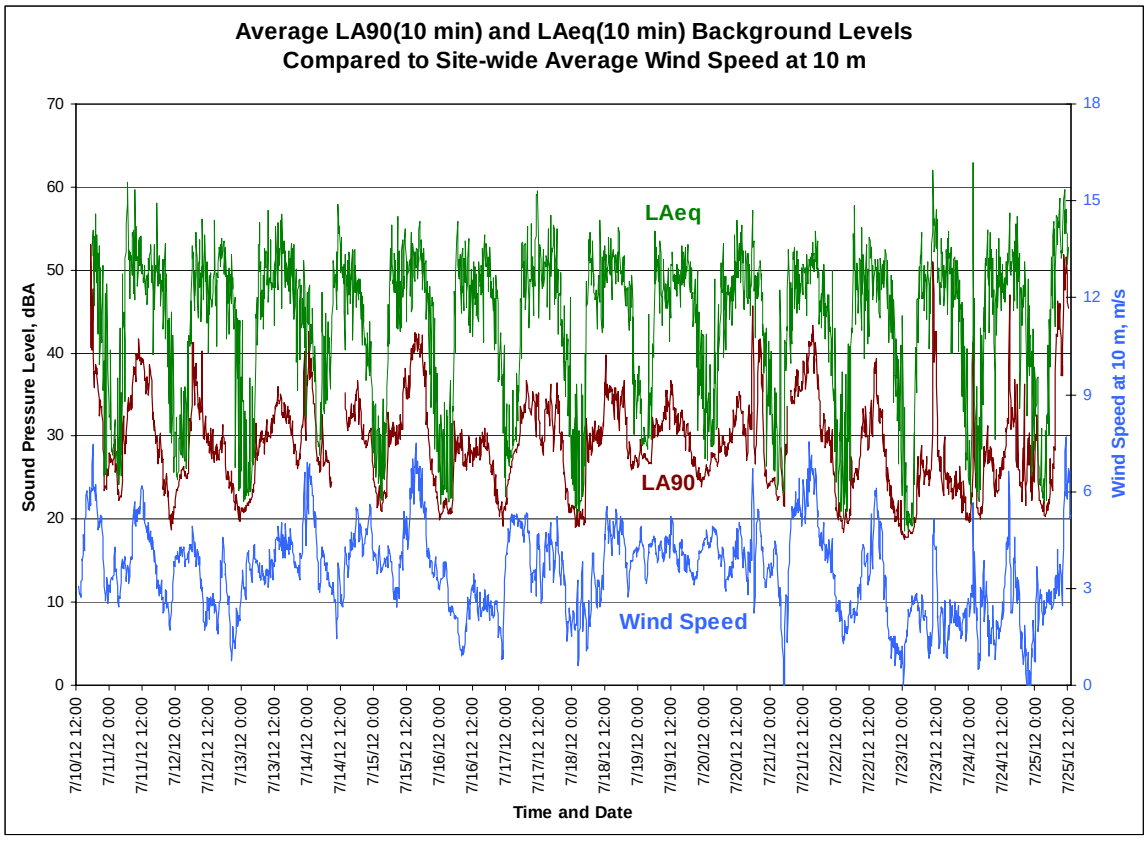


Figure 5.1.8.1

What is immediately obvious from this plot is that the $L_{Aeq,\ 10\ min}$ level is clearly driven by daily human activity; primarily intermittent vehicular noise on nearby sparsely traveled roads (noise that is filtered out by the L_{A90}). The L_{Aeq} levels rise to about 53 dBA every morning, stay there all day irrespective of the wind conditions and then gradually fall off in the evening hours bottoming out briefly somewhere around 23 dBA every night. The L_{A90} level, on the other hand, is clearly more attuned to the natural environmental sound level, which in rural areas like this one is normally a function of wind speed. The unsuitability of the $L_{Aeq,\ 10\ min}$ as a measure that might quantify project noise can be seen in Figure 5.1.8.2 where the average background L_{Aeq} level from Figure 5.1.8.1 is compared to the L_{Aeq} level measured at a typical, randomly selected on-site receptor.

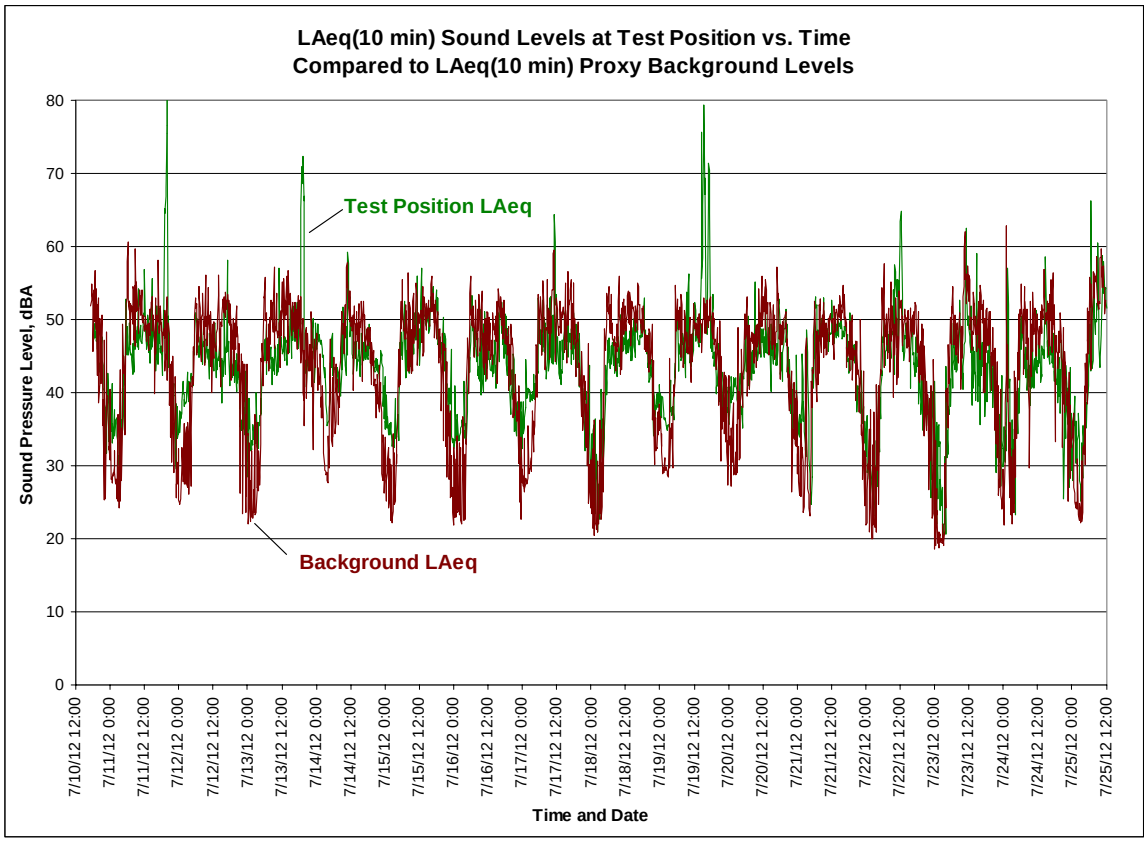


Figure 5.1.8.2

The $L_{Aeq,\ 10\ min}$ sound levels at both positions are virtually indistinguishable meaning that the project-only sound level simply cannot be deduced. Furthermore, it could even be reasoned that project noise is utterly inconsequential at this location because the on-site level is about the same or even lower than the off-site level, which is entirely free of any turbine noise, but, as we shall see later, that is not at all the case at this particular test position.

Finally, it is desirable to use instruments capable of measuring the frequency spectrum in 1/3 octave bands at one or two key locations with, usually Type 2, monitors measuring overall A-weighted levels at the majority of positions. The use of one or more frequency analyzers at key positions allows for some frequency analysis, although great caution must be exercised with the lower frequency bands, as discussed later, since wind-induced false signal noise is largely inevitable and the low frequency results cannot be taken at face value. Fortunately, this phenomenon does not significantly affect the measurement of A-weighted sound levels, however.

The use of 1/3 octave band analyzers is largely essential for surveys that, for one reason or another, must be conducted during summertime conditions when insect, frog or cicada noise is present. Measurements taken under these unfavorable conditions can be "corrected" to a certain extent by smoothing the high end of the frequency spectrum, where this kind of noise is usually obvious, and then recalculating the overall A-weighted sound level as shown in the (generic) example below.

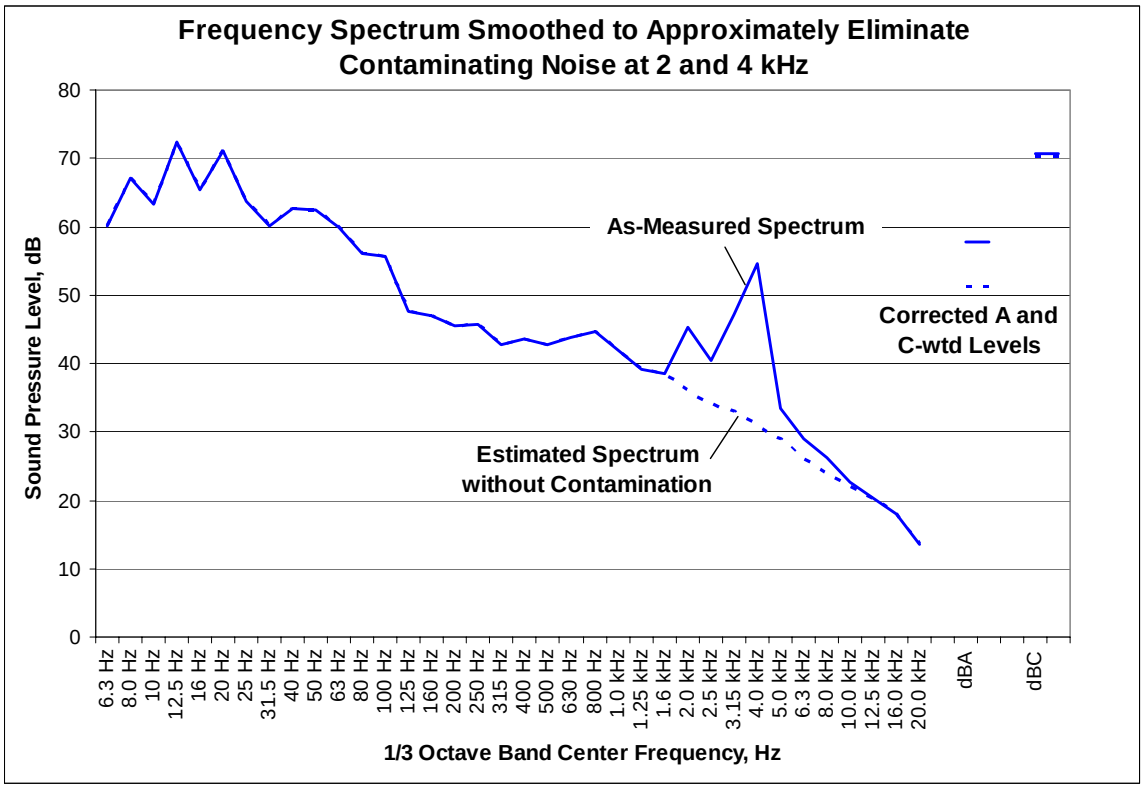


Figure 5.1.8.2

Of course, this correction would be laborious to perform for thousands or even just dozens of measurements so it is usually necessary to determine a typical correction, such as the -7 dBA adjustment that resulted in the example above, and apply that to all periods when this noise was apparently present. This is, of course, an imperfect remedy and the best policy is to avoid, if possible, measuring under these circumstances in the first place.

A solution to this common problem is currently being proposed by Hessler[33] and Schomer[34] in the form of a modified A-weighted network, termed "Ai-weighting", where all of the measured sound above 1000 Hz, or the 1250 Hz 1/3 octave band, is disregarded in situations where insect noise is present and an adjusted A-weighted sound level is calculated from the truncated spectrum.

5.1.9 *Wind-induced Microphone Distortion*

One of the principal errors in measuring wind turbine noise is false signal noise from wind blowing through the windscreen and over the microphone tip, which is manifested in the form of artificially elevated sound levels in the lower frequency bands. Taken at face value any measurement made in moderately windy conditions will ostensibly indicate relatively high levels of low frequency noise, irrespective of whether a wind turbine is present or not. This measurement error is probably one of the principal reasons wind turbines are mistakenly believed to produce high, if not harmful, levels of low frequency and infrasonic noise.

Some degree of distortion is essentially inevitable in any measurement taken above ground level when the wind is blowing, even when using an extra-large windscreen. It is in an effort to minimize this error that the IEC 61400-11 test procedure prescribes measuring on a reflective plate at ground level, where the wind speed is theoretically, although often not actually, zero. As previously mentioned, this ground plate technique is fine for short-term, attended measurements but is impractical for long-term surveys due to the potential for rain or melted snow to damage the microphone. Consequently, for lengthy compliance and evaluation surveys it is necessary to measure above ground level using a large, weather-treated windscreen - perhaps augmented with a very large secondary windscreen, although the practicality of such devices is questionable in harsh winter conditions.

Because environmental sound measurements of most other sources apart from wind turbines are not generally conducted in windy conditions as mandated by applicable standards, the significance and even existence of this measurement error has long gone unnoticed. Although this phenomenon and its physical basis were theorized decades ago by Strasberg[35,36] it is only fairly recently that its relevance to wind turbine sound measurements has been examined in detail and quantified. In particular, the subject of wind generated self-noise was thoroughly reviewed in 2006 by van den Berg[37] where he showed that the magnitude of the distortion depends not only on the mean incident wind speed but also on the amount of atmospheric turbulence present at the microphone position (largely a function of the local surface roughness) and on atmospheric stability. Measurements taken at 1 or 2 m above a smooth surface during stable, nighttime atmospheric conditions, when the surface winds are usually light, generally contain the least amount of self-generated noise ultimately replicating the case where the principal noise generation mechanism is wake turbulence trailing off the windscreen. In other less ideal circumstances self-noise levels can be developed by estimating the local surface roughness and atmospheric turbulence factor, Ψ, from wind speed measurements at two heights and/or from observations of cloud cover, time of day, general wind conditions, or meteorological data, if available.

The minimum level of false-signal noise due to wind, excluding the effect of atmospheric turbulence, can be estimated based on an empirical wind tunnel study carried out by Hessler and Brandstätt in 2008[38] in which conventional ½" microphones fitted with an array of common windscreens and were subjected to known wind velocities in a massively silenced wind tunnel. The measured sound levels during each test were essentially a direct measure of the false-signal noise – although for more or less laminar flow conditions corresponding to an outdoor setting with a very low surface roughness in neutral atmospheric conditions. Nevertheless, for the specific windscreens examined it is possible to generally estimate both the overall A-weighted or un-weighted (dBZ) sound level of the distortion from the microphone height wind speed and then subtract it from the total measured level to *largely* reverse the error.

An example is shown in Figure 5.1.9.1 where the overall A-weighted level of self-noise is calculated as a function of wind speed and subtracted from the as-measured sound

level. The plot is a three day detail of a wind turbine survey where oversized 175 mm (7") diameter treated windscreens (ACO Model WS7-80T) were used. This particular windscreen was found to be the best performer, in terms of minimizing wind-induced self-noise, in the wind tunnel study.

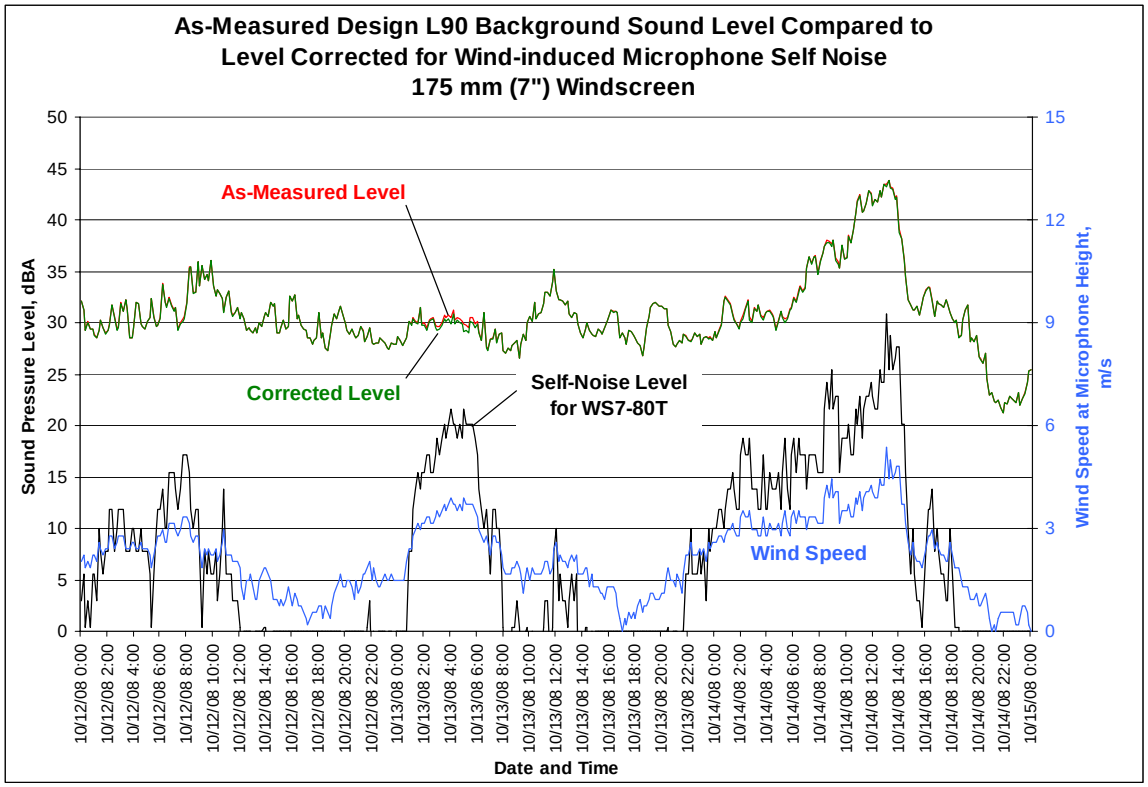


Figure 5.1.9.1

This figure shows the very typical result, at least where extra-large windscreens are used, that the correction is insignificant and can be essentially neglected when it comes to A-weighted sound levels. This is because with a large windscreen the distortion is confined to the very lowest frequencies where it has almost no impact on the A-weighted sound level. With a conventional 75 mm (3") windscreen, on the other hand, wind-induced noise begins to become significant in the mid-frequency region, between about 63 and 400 Hz, where it has much more influence on the A-weighted sound level. Consequently, standard windscreens are not recommended for this type of survey and windscreens with a minimum diameter of 7" are recommended for wind turbine field work.

The empirical wind tunnel study results for 175 and 75 mm treated windscreens are shown below.

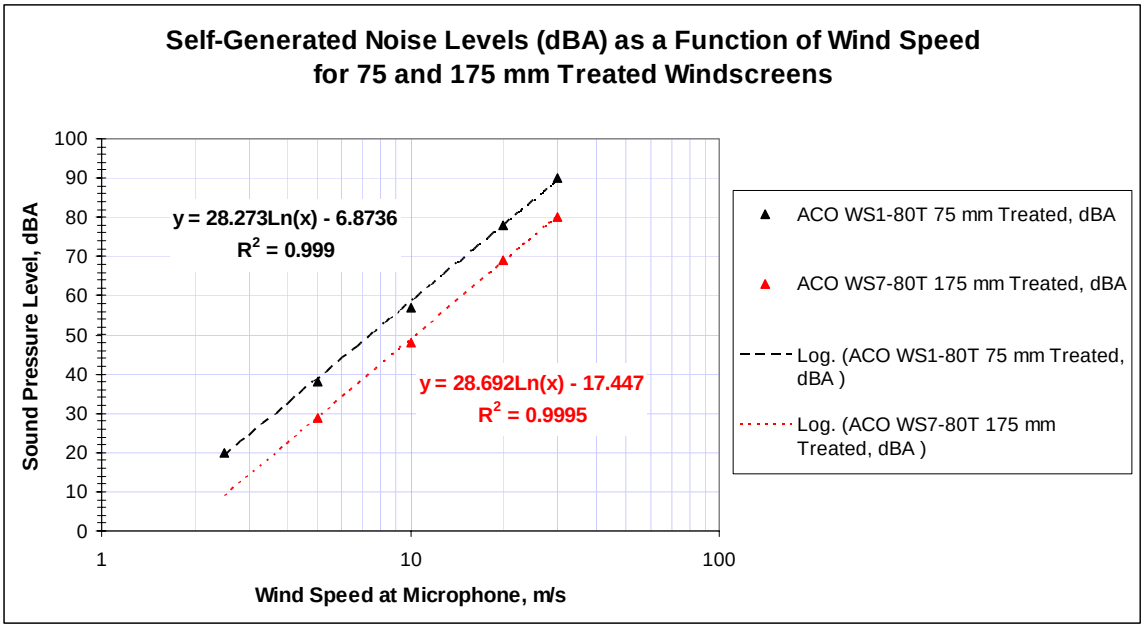


Figure 5.1.9.2

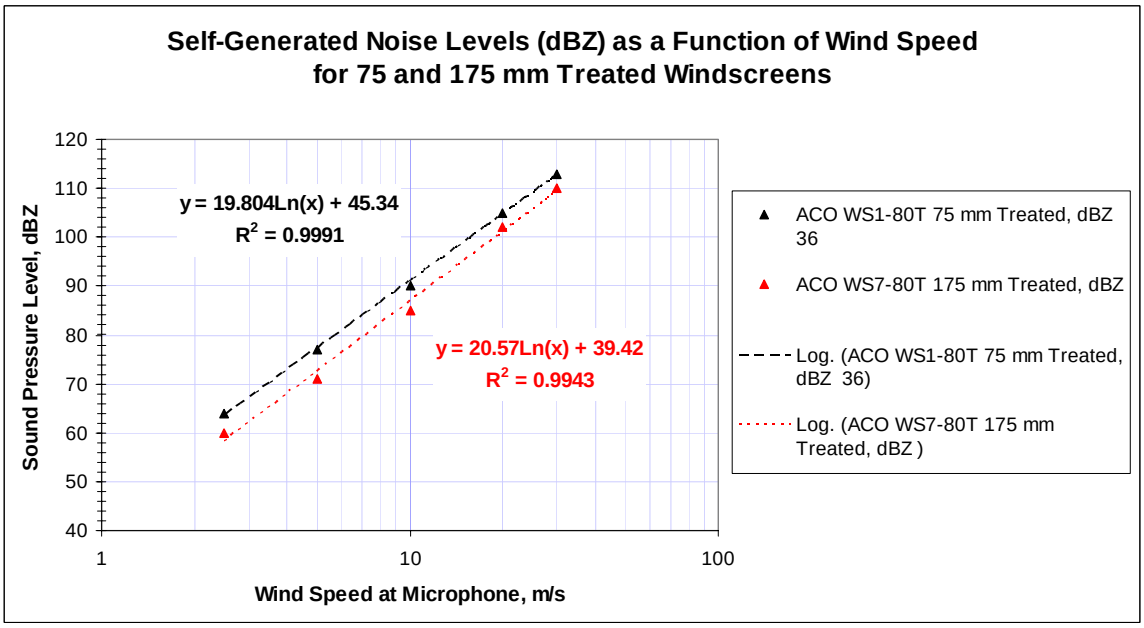


Figure 5.1.9.3

The overall level of self-generated noise for these windscreens may be estimated from the general expression below with the understanding that local atmospheric turbulence is not accounted for and a neutral atmosphere is assumed.

$$L_{p,self} = A \ln(v) + C, \text{ dB} \quad \text{for } v>1.5 \text{ m/s} \quad (1)$$

Where A and C are constants given in the table below and v is the normally incident wind speed at the microphone in m/s.

Table 1 *Constants for A and Z-wtd Self-Noise Calculation Algorithm (Neglecting Atmospheric Turbulence)*

Windscreen Type	A-weighted Sound Level, dBA		Un-weighted Sound Level, dBZ	
	A	C	A	C
75 mm (3") Treated	28.273	-6.8736	19.804	45.34
175 mm (7") Treated	28.692	-17.447	20.57	39.42

In a real atmosphere the sound level may be higher or lower than given in Table 1, depending on the turbulent energy present, which again depends on the stability of the atmosphere. In a neutral atmosphere, which occurs at higher wind speeds (> 6 m/s at 10 m height) or in very clouded conditions, the wind-induced level might be anywhere from 5 to 9 dB higher than the levels shown above. After sunset, when the atmosphere is more prone to be stable, the wind-induced noise levels will be more similar to the values given above.

5.1.10 *Correction for Background Noise*

Once a design L_{A90} background sound level has been developed from averaging the data collected at the off-site proxy positions it can then be subtracted in the usual logarithmic manner[d] from the levels measured at each of the on-site positions to deduce the project-only sound level. However, this correction process is only relevant to samples recorded while the turbines were actually in operation and not necessarily to all samples; consequently, the data must be sifted to ignore all periods of calm winds. This can be accomplished by dealing only with data sets collected above the effective cut-in wind speed for the turbine model in question (bearing in mind whether that wind speed is measured at 10 m or hub height) or, more preferably, by comparing the measured data to a time history of project electrical output obtained from the SCADA, or project control system. For this latter option it is best to compare the operational output of the 2 or 3 units closest to each on-site measurement position rather than the total project output because this not only accurately defines the on and off times at each monitoring station but also may reveal, the fairly common occurrence, that certain units were temporarily down for maintenance or due to some unexpected malfunction. The relevance of this, of course, is that the measurements of project noise during this period would not have captured the maximum possible sound level.

Because the proxy background level is, for practical reasons, an inexact estimation of the site-wide background level, there will usually be instances when the background level exceeds the total measured level at certain on-site positions. Under this circumstance, and when the background level is below but within 3 dB of the total level, the project-only sound level would normally be considered indeterminate. While the calculation of

[d] $Lp_{Project} = 10 \log [10^{\wedge}(Lp_{Total}/10) - 10^{\wedge}(Lp_{Background}/10)]$, dBA

the project-only sound level is mathematically possible when the background level is below but within 3 dB of the total level, doing so tends to create spurious mathematical artifacts where the project level can be estimated at unrealistically low and obviously incorrect sound levels. Since most standards, such as ISO 3746[39], essentially disallow this calculation it is best to follow that policy here as well.

5.1.11 *Typical Test Results and Comparison to Model Predictions*

Representative examples from typical test positions within two different wind projects using two different turbine models and located in two different states are discussed below as a way of illustrating the outcome of the test methodology outlined above.

Example 1

The first example is from a test position at a residence within a project in a rural area in the Eastern United States where the turbines and homes are thoroughly mixed together – a common situation in this region and the Midwest. This location is surrounded in nearly all directions by a number of turbines at various distances, the closest being about 490 m (1600 ft.) away from the home with another 10 lying within a 1500 m (4900 ft.) radius. The terrain is gently rolling hills with a mixture of open fields and wooded areas. Mild complaints about noise had been received by the project from the residents of this home, which is the primary reason it was selected as a monitoring position.

The overall test results from a two week measurement survey in terms of the total measured level at the test point, the design background level derived from proxy positions and the normalized 10 m wind speed, are shown in Figure 5.1.11.1. This is same test position that was previously discussed in conjunction with Figure 5.1.8.2 and L_{Aeq} sound levels.

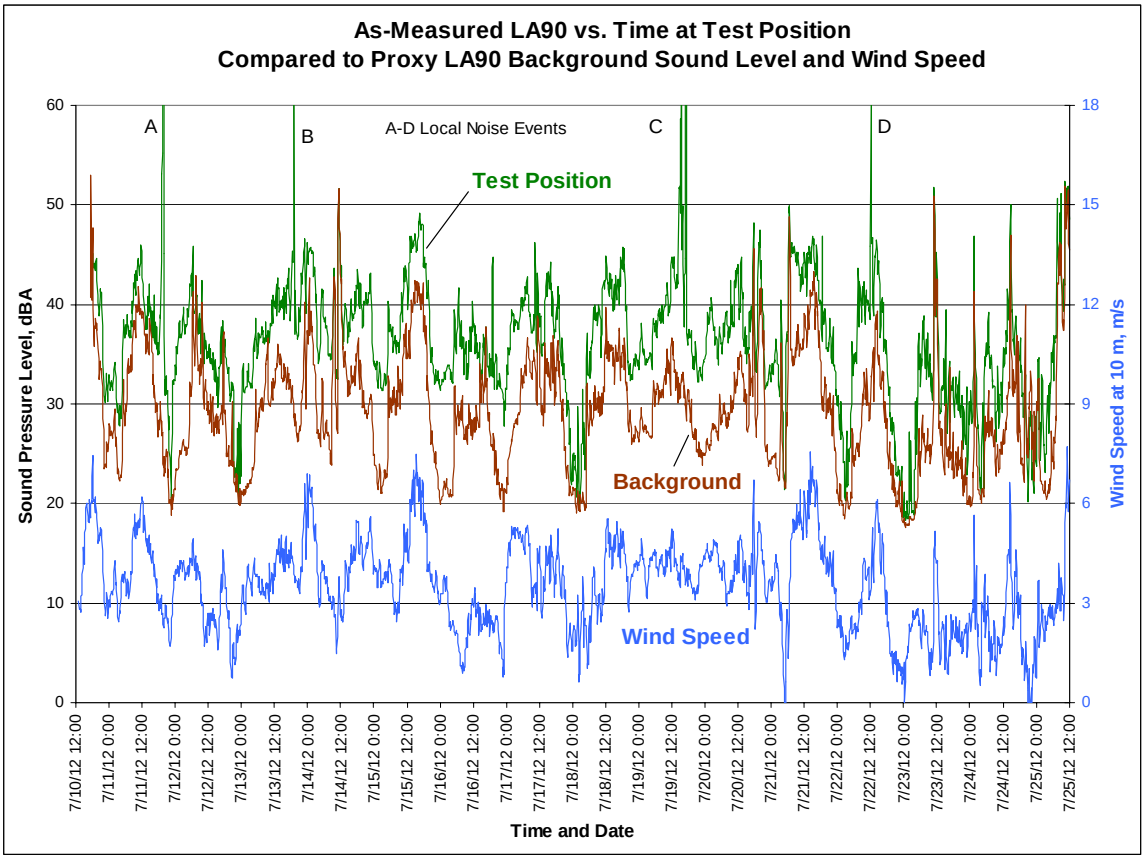


Figure 5.1.11.1

Although the raw results may appear unintelligible at first glance, a closer look reveals that the design background level (developed from an average of three off-site measurement positions) and the sound level at the test position both generally parallel the wind speed indicating that the measured levels are due to wind-induced sounds associated with the natural environment in the first case and to both natural and wind turbine sound in the second. As expected, the on-site level at the position surrounded by almost a dozen turbines is usually substantially higher than the background whenever a moderate wind is blowing and, also as expected, the on-site level is similar to the background during calm conditions when the project is not operating. It is the difference between these two levels during windy conditions that essentially constitutes and quantifies the noise impact of the project. As is evident from the plot, it is an ever-changing dynamic situation where the project sound level variously exceeds the background by anywhere from 0 to 10 dBA. This figure graphically points up the inadequacy of attempting to determine the project's noise emissions from a few short-term manned samples. The greatest differentials between the on- and off-site level tend to occur at night but it is important to note that while the project level may be quite a bit higher than the background, the sound level at the receptor point often remains very low in absolute terms with unadjusted raw levels commonly in low to mid 30's dBA.

Taking these test results through the next steps of correcting the on-site level for background noise and parsing out the low wind periods when the project was idle

produces the following plot where the nominal project-only sound level is shown as a function of time over the survey period.

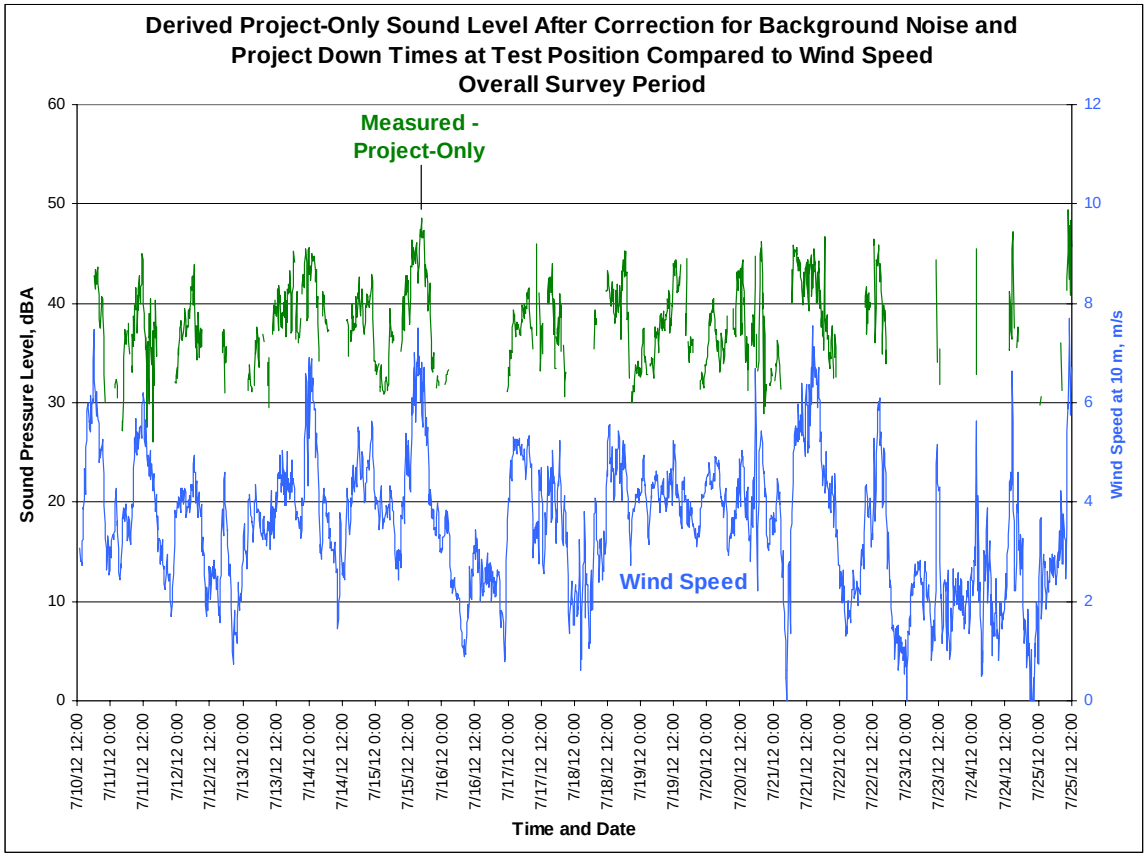


Figure 5.1.11.2

In terms of magnitude the project apparently generates sound levels ranging from 30 to 49 dBA at this location, depending largely but not only on wind speed. The fact that the project sound level does not exactly parallel the wind speed (which was derived from high elevation, rotor height anemometers) indicates that other atmospheric factors play a significant role in determining exactly how loud the project is at this location at any given moment.

What Figure 5.1.11.2 is technically showing is the baseline - L_{A90} - project sound level that is consistently present during each 10 minute measurement period. This means that somewhat higher sound level excursions lasting a few seconds to a few minutes are possible, if not probable, but it is not practical to capture the moment to moment variation over the lengthy survey period needed to adequate evaluate long-term project sound levels. However, comparing these results to model predictions based on the turbine sound power level indicates that the L_{A90} approach does not inadvertently underestimate project levels, as might be suspected. Figure 5.1.11.3 plots the modeled project sound level at this test position (using the procedures outlined in Section 4.1) against the measured project-only sound level. For clarity a detail of a representative three day period from the third to the sixth day of the survey is shown.

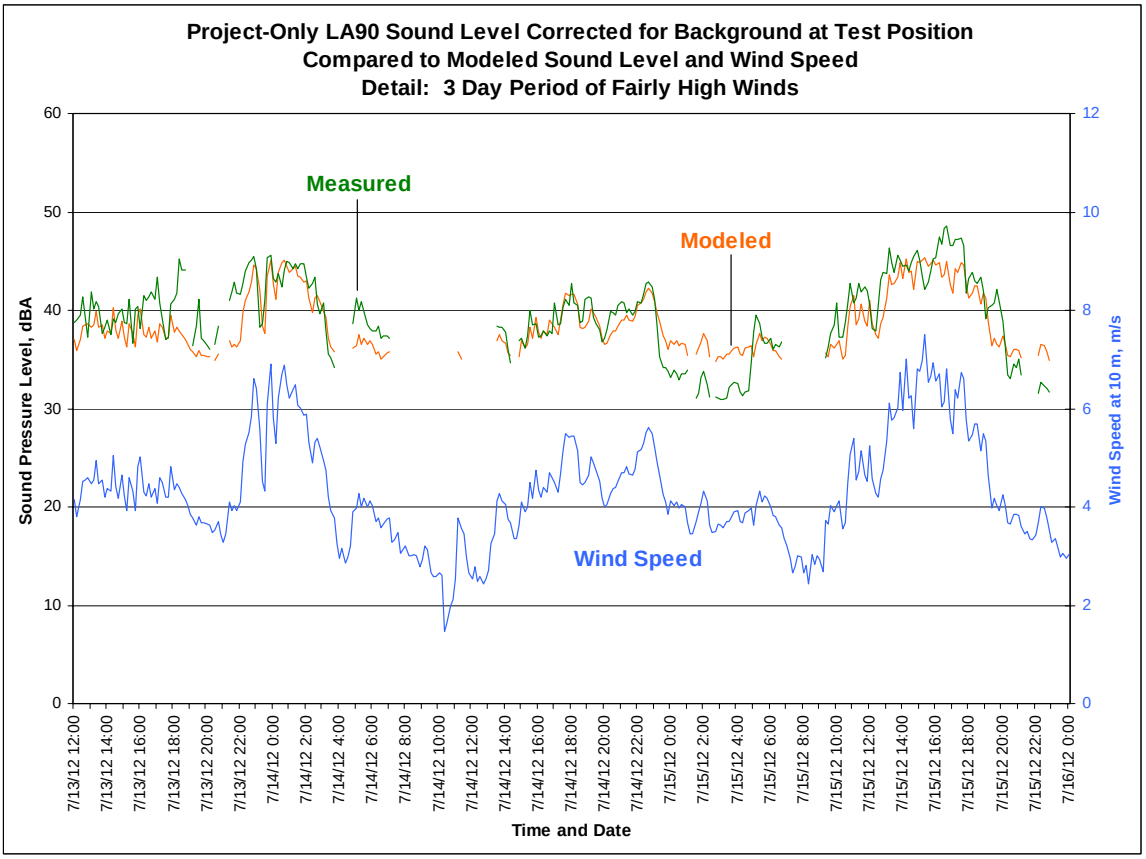


Figure 5.1.11.3

The modeled level is derived using a curve-fit polynomial function based on the predicted project sound level at integer wind speeds, which in turn is based on the turbine sound power level at those wind speeds taken directly from an IEC 61400-11 field test report. In general, the plot shows that the model prediction, based solely on the turbine's sound power level at specific wind speeds, provides a reasonably good approximation of the actual observed sound level.

Example 2

The second example is from a site in the Midwestern United States where the turbines are again intermixed with scattered homes and farms in a rural setting. This particular test location was adopted in response to, what turned out to be understandable, complaints about noise from a participant's "own" turbine that had been sited at the unfortunate distance of only 180 m (600 ft.) from the house. The raw test results are summarized in Figure 5.1.11.4.

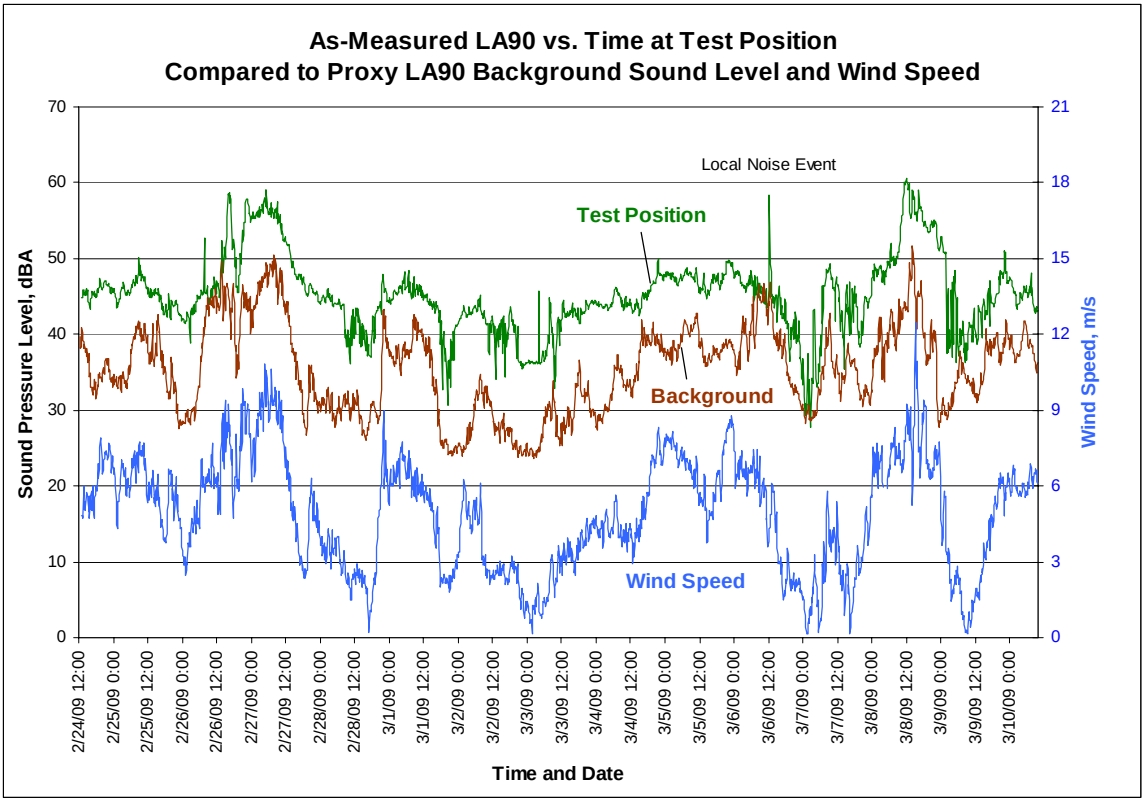


Figure 5.1.11.4

In this instance, the total sound level at the house is consistently and not surprisingly well above the background level developed from four off-site monitoring stations, meaning that much of the time background noise was largely insignificant, if not inaudible. The corrected project-only sound level for a three day windy period near the beginning of the survey is shown below compared to model predictions.

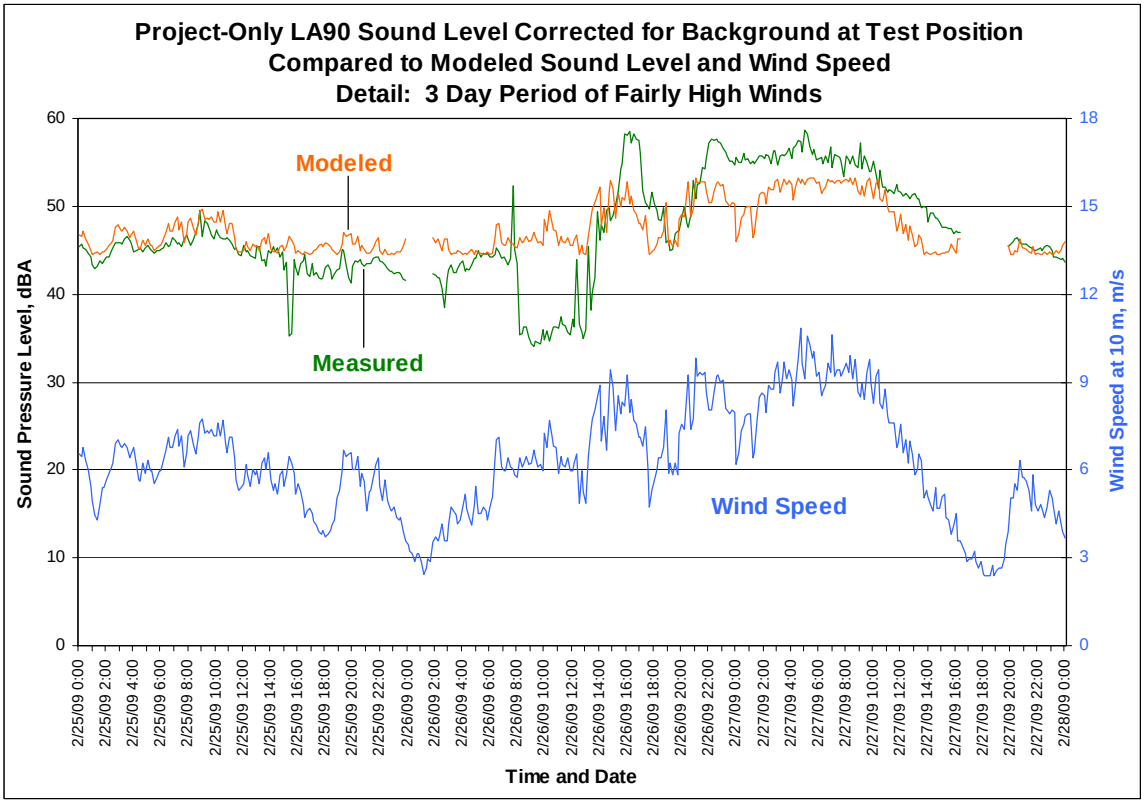


Figure 5.1.11.5

In this instance, as with Example 1, the predicted level intertwines with the measured level, sometimes over-estimating, sometimes underestimating but generally capturing the mean project sound level. The variation above and below the predicted level is largely a measurement of how all other factors beyond the simple wind speed are affecting the total sound level perceived at this location. One of these factors may be unique to the turbine model used at this site, which, based on other surveys and observations, appears to have a tendency to produce sound levels in excess of the manufacturer's stated performance in high wind conditions, which may be part of the reason the actual level significantly exceeds the expected levels in the second half of this sample period. This same departure between the predicted and measured levels also appears in the regression analysis below for the entire survey period where the project-only sound levels are plotted as a function of wind speed.

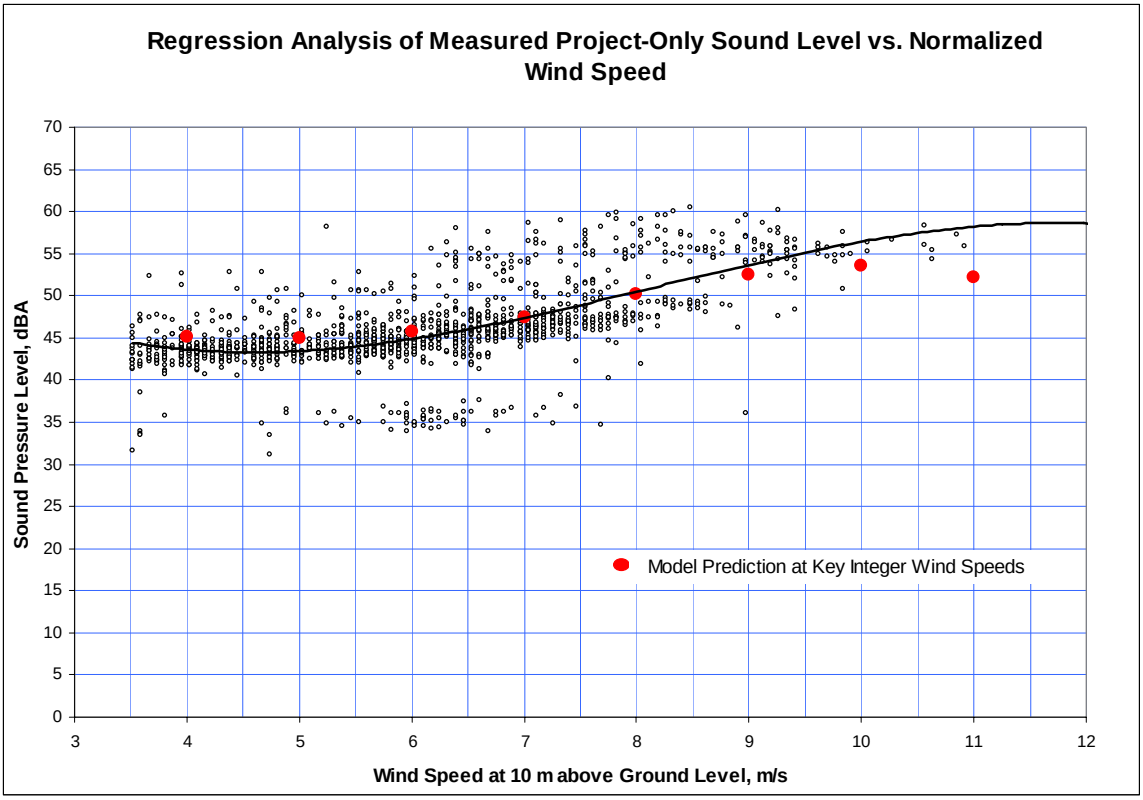


Figure 5.1.11.6

Good agreement with the mean trend is evident up to about 9 m/s but not beyond it.

These two examples are presented to illustrate the outcome of the test methodology and are generally representative of the typical results obtained at a number of test positions over a number of such surveys. That is not to say, however, that the method is infallible and that mismatches between measured and predicted levels will never be found. Testing wind turbine noise is challenging and inherently imprecise because the sound sources themselves and the propagation of sound from them to a given point of interest is dependent on the environment in general and amorphous wind and atmospheric conditions in particular.

5.1.12 *Interpretation of Test Results Relative to Permit Limits*

The regression plot above (Figure 5.1.11.6) exhibits the typical behavior where there is a scatter to the test results and the project sound level is not a perfectly fixed quantity at a given wind speed. This is an unavoidable consequence of the nebulous atmospheric conditions mentioned above. The question that this raises, however, is how to interpret the results of the survey relative to the absolute, or in some cases relative, noise limits contained in planning consent or permit conditions. Excursions, sometimes very substantial excursions, above the mean project sound level are inevitable and under all normal circumstances it would be a complete impossibility to design and lay out a project so that the sound level never exceeded a specific value at a particular point or, more realistically, at a large number of residences within the vicinity of the project. Only

projects in obviously remote locations could ever be comfortably designed to such a limit. Consequently, the possibility, even likelihood, that project noise will occasionally spike for short periods should be factored in to regulatory limits. That this issue is not addressed in current laws or limits pertaining to wind turbines is simply a result of the understandable fact that few are aware that it is even an issue.

As a suggestion, it seems reasonable to conclude that a project is in compliance with an absolute regulatory limit if the measurements indicate that the project-only sound level is lower than the stated limit at least 95% of the time, taking that number from the commonly used statistical confidence interval.

5.2 Single Site Investigations

In addition to evaluating operational sound levels on a project-wide basis with regard to regulatory compliance, it is sometimes necessary to carry out dedicated field surveys, usually in response to complaints, that are focused only on a specific point. Although each of these situations is certainly unique, the general test approach outlined above can generally be applied with the exception that more resources can be brought to bear on understanding the project sound level at that particular location.

5.2.1 *General Test Design*

The general test set up for a diagnostic or investigative sound survey at a single point would follow the procedures described for a site-wide test in terms of survey length, equipment and measurement technique with the following enhancements.

The primary measurement position will be outside the residence or point of interest where it is usually prudent to use multiple instruments for redundancy and/or increased functional capability. For example, it is highly desirable to measure the overall A-weighted sound level, the frequency content in 1/3 octave bands and to store audio recordings whenever an appropriate trigger level is reached. While all three of these things can be achieved by some instruments, it would be safer to use the 1/3 octave band analyzer to store numerical data and use a second instrument to store both back-up A-weighted data and the audio files. In any case, having multiple instruments can also allow for additional time resolutions (beside the standard 10 minute periods) to be recorded at the same time; 1 minute or 1 hour data, for instance. In addition to the sound recording equipment a weather station recording wind speed at microphone height, wind direction and rainfall, among other common parameters, should be set up nearby.

The specific measurement position should be at a location with exposure to all of the nearest turbines or at a place that replicates the exposure of the residence to the project but is removed from any sources of local contaminating noise (HVAC equipment, farm machinery, human activities, etc.).

As with a more general survey, the background level is still of just as much concern so 2 to 3 proxy background measurement positions should be found in opposite directions that are remote from any turbines and, in this particular case, replicate as closely as possible the setting of the principal test location in terms of terrain, exposure to wind and exposure to other noise, such as from a road.

The principal and proxy background positions above will theoretically determine what the project sound level is at the residence but may not indicate why it is. To this end several additional monitoring stations close to the 3 or 4 nearest turbines are recommended that are ideally located in line with the principal position at the standard IEC 61400-11 test distance of the hub height plus half the rotor diameter (typically around 125 m, or 400 ft.). A hypothetical test set up involving four nearby turbines is shown in Figure 5.2.1.1.



Figure 5.2.1.1

Note that several of the intermediate positions are slightly off the direct sight line to keep them in open and reasonably accessible areas. Although this hypothetical example was conveniently conducive to this test set up, additional complications are likely to arise; in particular access to private property, which may call for some creativity in designing the

test layout. Nevertheless, the idea is to gauge the individual contribution from all of the nearest units over a variety of wind directions and weather conditions to determine if the problematic noise levels are principally associated with perhaps one unit or a particular set of wind conditions. Moreover, the principal purpose for measuring the noise emissions of all the nearest units is to be able to estimate the actual sound power level of each unit and analytically calculate, by means of a simple spreadsheet model, or modeling software, the total sound level at the house for comparison to the measured level there. This approach allows the individual contribution from each unit to be quantified for different conditions and also helps confirm, in a manner independent from the proxy monitoring approach, how much of the received signal at the principal measurement location is due to the project and how much is background noise. In addition, the sound power level of each unit can be informally checked against the manufacturer's warranty value.

While the ground board technique specified in IEC 61400-11 is not practical for long-term, unattended measurements - mainly because of concern about rain - a comparable, if somewhat less rigorous, result can be obtained from measuring at 1 m above grade by placing the microphone or monitor on a tripod or temporary post at the appropriate distance. In Figure 5.2.1.2, for example, measurements were made simultaneously at 1 second resolution with a microphone on a ground plate and with two additional microphones at 1 and 2 m above it. The average and consistent differential between both above ground positions and the microphone on the reflective plate was 2.7 dB, which is close to the ideal 3 dB differential that one would expect.

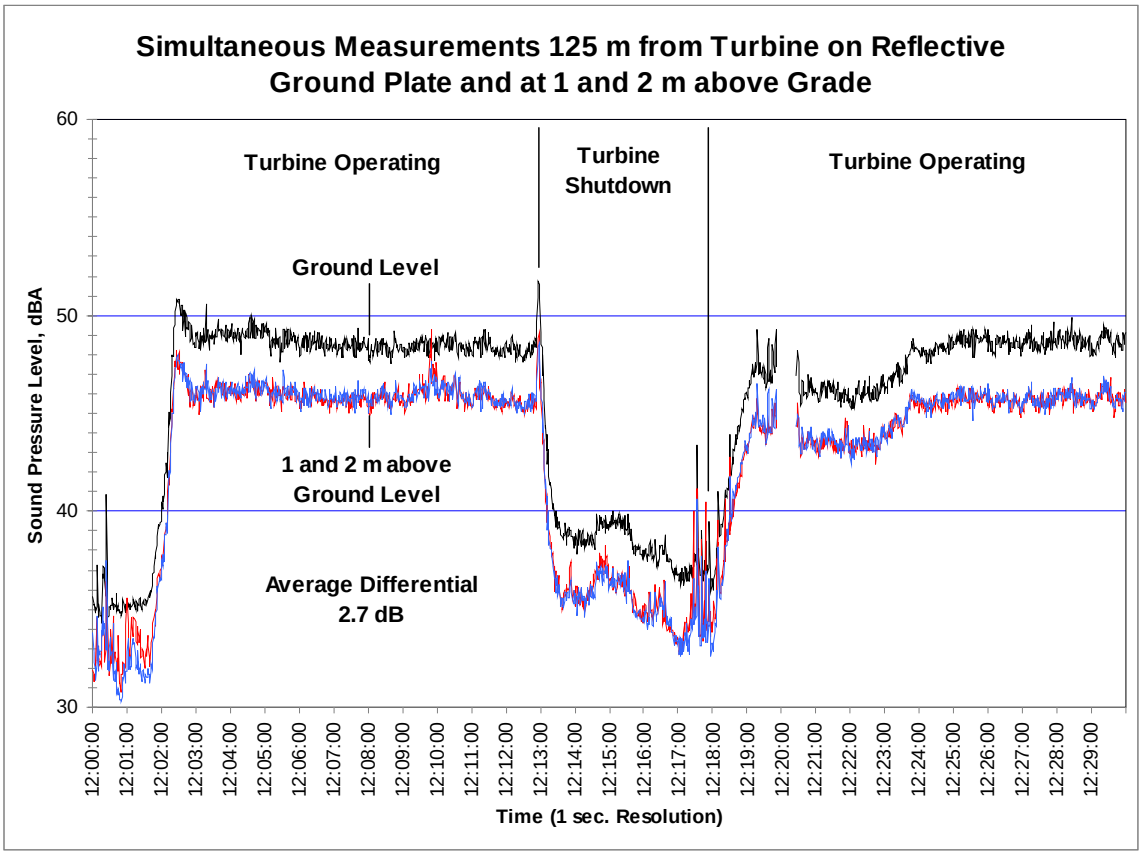


Figure 5.2.1.2

This example illustrates that it is possible under certain circumstances to reasonably measure the apparent A-weighted turbine sound power level above ground level without serious degradation due to wind distortion. Of course, this may not be true when it is particularly windy at 1 m above ground level. Another potential complication arises when multiple turbines are in unusually close proximity to each other, as they are in Figure 5.2.1.1, and background noise or cross-contamination from one unit to another must be taken into account in such cases. In general, however, the only substantive modification to the IEC 61400-11 process for calculating sound power level would be to change the constant "6" to "3" in Eqn. (9) of the standard since above ground measurements are being used.

As suggested by Figure 5.2.1.2, an additional tool that is normally useful and practical for single site investigations is to temporarily shutdown, for 10 to 20 minutes, the nearest turbines to the point of interest, if not all those that could conceivably be affecting the sound level there, in order to obtain direct measurements of the background level so the project-only level can be derived with some confidence from the operational sound levels occurring just before or after the shutdown. A short-duration shutdown helps ensure that the wind and weather conditions are essentially identical for both the on and off measurements. This technique also offers a way of verifying the validity of the levels measured at the off-site background positions. It is usually during the times of peak noise that it is most desirable to have an exact measurement of project's sound level, since

these are the noise levels that most likely engendered the complaint in the first place. Consequently, it becomes a matter of either being there when these conditions occur, which is frequently at night, to organize the shutdown - or putting control over the shutdown in the hands of the resident who can call in by pre-arrangement to the control room if and when the noise becomes objectionable in terms of its overall magnitude and/or begins to exhibit some adverse character, such as from amplitude modulation. Although this latter approach of allowing the resident identify the time of maximum noise has been used successfully to quantify the overall magnitude of project noise and its frequency content in 1/3 octave bands, one must really be on hand to manually measure amplitude modulation, since it calls for the use of an extremely fine time resolution, on the order of milliseconds, to capture the sound oscillations that normally have a period of roughly 1 second. Such manual measurements can be taken indoors, where this kind of noise is most often observed to be objectionable, as well as outdoors.

Only with attended measurements it is possible, and then only occasionally, to measure indoor sound levels in any kind of meaningful way because contaminating noises can be observed and, hopefully, factored out. Long-term monitoring is effectively limited to the outdoors for the fundamental reason that there is no way to ascertain the background sound level inside of a dwelling at a particular time with the project operating. This is because the background sound level indoors is driven by a unique set of seemingly minor but significant sound sources that cannot be replicated by a proxy measurement position. Indoor background sound levels are partially a function of the outdoor conditions, particularly when it is windy or raining, but are also driven by such things as air flow from the heating and air conditioning system, appliances, computers and, of course, human activity even when it is in a distant part of the house. These usually very minor sounds are significant because the intruding noise level from the project is often very low or extremely low in terms of the A-weighted sound level. For example, it would not be unusual for a project sound level to be in the vicinity of 30 dBA inside of the house (perhaps being in the 40 to 45 dBA range outdoors). The successful measurement of the project-only sound level would then require the indoor background level to be 20 dBA or less, which is usually not the case. Sound levels in a bedroom at night are commonly at least 30 dBA even when no wind project is present.

In any event, it is sound level outside of dwellings that is normally (but not always) restricted by regulations or permit conditions and this level can typically be measured with the long-term monitoring methodology described above.

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Noise
Session 3aNSa: Wind Turbine Noise I

3aNSa3. Criteria for wind-turbine noise immissions

George Hessler* and Paul Schomer

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Each of the two authors has developed single, 24-hour, constant wind turbine noise criteria; the criteria are constants because wind turbine noise is basically not adjustable. Hessler develops his criteria from his knowledge of how wind turbine noise is being regulated at the local, state, and national levels, from regulations in other countries, and from his extensive experience with numerous wind turbine projects. Schomer develops his recommended criteria on the basis of existing national and international standards, notably ISO 1996-1 and ANSI/ASA S12.9 parts 4 and 5. Ultimately, Hessler comes up with a single, 24-hour A-weighted average criterion of 40 dB, and Schomer comes up with a 24-hour, A-weighted average criterion of 39 dB. These two researchers have decidedly different backgrounds, different experience, and a slight difference in orientation towards the industry. Thus, it is remarkable that these two criteria, derived in such different ways result in nearly identical 24-hour A-weighted criteria levels. Although there is essential agreement in immissions criterion, there are variables debated herein for both modeling wind turbine emissions and certifying such emissions at far-off receptors that could result in a 10 dBA difference in the actual immissions level.

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INTRODUCTION

Criteria for wind-turbine noise immissions should address all aspects of the receiving pressure level including magnitude and character. For wind-turbines this should include at least the overall A-weighted level related to annoyance, possible spectrum imbalance, infrasound/low frequency noise (LFN), tonal issues, and any other unusual character issues such as occasional “thumping." Space limitations and the current extent of scientific knowledge of this subject do not allow for a full discussion in this paper, although each aspect will be touched on. The main focus is criteria to minimize annoyance from wind-turbine immissions.

Hessler Associates, Inc. has worked on over 70 wind-turbine projects over the last decade and has published a peer-reviewed journal paper recommending a design goal of 40 dBA or less at residences coupled with a maximum legal criterion of 45 dBA, all based mostly on observations and experience.[1] Schomer and Associates, Inc. is a recognized world-wide expert in community noise and also has worked on numerous wind-turbine projects--about equally for project developers and anti-project advocacy groups. Schomer, using a wholly different approach than Hessler, recommends a design goal of 39 dBA at residences to minimize annoyance.

This paper presents measured data of a typical wind farm in the American Midwest, provided by Hessler and a discussion of those data and some data analyzed along with a discussion by Schomer of some Western data, both insofar as they pertain to aspects of immissions criteria.

The purpose of this paper is to compare and contrast the views of the two authors. Note in the sections that follow, the material of a particular author represents the views of that author, and not necessarily the views of both authors. However, the conclusions do reflect the views of both authors.

TYPICAL WIND FARM IMMISSION SPECTRA AND LEVELS – HESSLER

Figure 1 presents data from a very typical wind farm composed of (90) 1.8 MW wind-turbines dispersed over approximately 88 sq km (34 sq miles) of flat farmland with nearly 500 residences. The rotor diameter and hub height are 90 m and 80 m, respectively. The data presented are from a rigorous certification measurement survey where sound levels and spectra were measured over three periods during midday (12 pm – 2 pm), evening (6 pm – 8 pm) and night (10 pm – 12 am).

The project layout was designed by the owner using a minimum buffer distance of 381m (1250 feet) from the closest turbine to any residence. Measurements were made at four “worst case” locations that were miles apart but had both the closest and the largest number of turbines adjacent to a residence.

Measurements were performed with an off-the-shelf type 1 precision sound level meter with its frequency range extended down to the 0.4 Hz one-third octave-band, although the rated frequency response of the microphone is ± 1 dB from 5 Hz to 20,000 Hz. A separate test comparing this off-the-shelf system side-by-side to a custom designed system with a proven accuracy of ± 1 dB from 0.1 Hz to 20,000 Hz demonstrated that the off-the-shelf sound level meter system measured accurately down to the 2 Hz one-third octave-band--better than the manufacturer's published rating. Levels below 2 Hz in Figure 1 show microphone roll-off.

Measuring low-frequency sound in the presence of wind at a height of 1 to 1.5 m above grade is problematic as will be shown. The microphone was protected with a 175 mm (7 inch) diameter foam windscreen with 20 ppi porosity to minimize pseudo noise and wind-generated pulsations.

The owner was quite cooperative, and measurements were made for 10-minute periods with all turbines operating followed by the same measurements with all contributing turbines shut down to obtain ON/OFF measurements. The plotted data are the arithmetic average of the median spectra and L50 during the twelve ON and twelve OFF 10-minute periods. Three measurement periods at each of four residences yielded twelve ON/OFF results.

Wind conditions varied, but the average wind speed at the 80 m hub height was 9 m/s (7.5 to 11.6 m/s range), and at the 1 m microphone height, the average wind speed was 2.9 m/s (1.7 to 4.4 m/s range).

The measured A-weighted levels shown on Figure 1 are 43.6 and 39.3 dBA, ON and OFF, respectively. Applying the standard background correction calculation yields an average noise immission from the turbines of 42 dBA.

Community Response to this Wind Farm

The community response to the example wind farm noise that encompasses 489 non-participating residences and 42 participating residences (residents leasing land for wind turbine installation) can be described as minimal adverse response with no claims of health issues. To our knowledge, there are continued complaints from two residences that opposed the project from the beginning, but no other complaints in four years of operation (2009 through 2012). It is not known how many residents, if any, would give a negative response in an area-wide survey or questionnaire, but we can certainly conclude that the percentage of highly annoyed residents is not large.

ANALYSIS AND CONCLUSIONS FROM DATA – HESSLER

A-weighted Criteria

The resulting community response to this wind farm and many others like it leads us to reaffirm our 40 dBA design goal and 45 dBA criteria recommendations given in Hessler and Hessler (2011). When developers are able to lay out the project with our modeling assistance, i.e. space permitting, experience at every such site is no adverse response. When space is more restrictive, a number of residents will experience higher levels than 40 dBA, but none higher than 45 dBA. Since criteria must be met, contingency or safety factors are often applied with the result that the actual immissions level falls between 40 and 45 dBA. The example data set above had an average of 42 dBA at the closest turbine to receptor locations. Hessler believes this is exactly the result desired--a reasonable balance between protecting the acoustic environment weighed against an environmentally friendly source of power generation.

We should point out that the example community is made up of quiet, rural farmland, and when winds are calm and still (i.e., when there is no wind at ear height and no visible movement or audibility of high elevation tree leaf and branch coverage) the residual LA90 drops to the low twenties usually in the early morning hours. Some anti-project consultants continue to erroneously assert that a 40-45 dBA sound imposed upon such an environment (a 20-25 dBA increase) creates a huge impact. As the following shows, this is not the case. It is recognized that wind shear and topography effects reduce ground level wind speed below hub height speed, but those factors never reduce wind speed to calm and still conditions.

Schomer has analyzed data for long-term measurements with repeated samples with turbines on and off over the past seven months. These data show that the *largest* difference in sound level between these two conditions is about 10 to15 dB in a very quiet rural setting. This difference occurs mainly during the night and mainly during the summer and during these times the ground winds frequently have been observed to be less than 0.5 m/s. Although, winds at microphone height were less than 0.5 m/s, wind at hub height was sufficient for near or full power and yet the 10 to 15 dBA difference was maintained. For the example site, Figure 1, the largest delta between the twelve on and off measurements was 9 dBA.

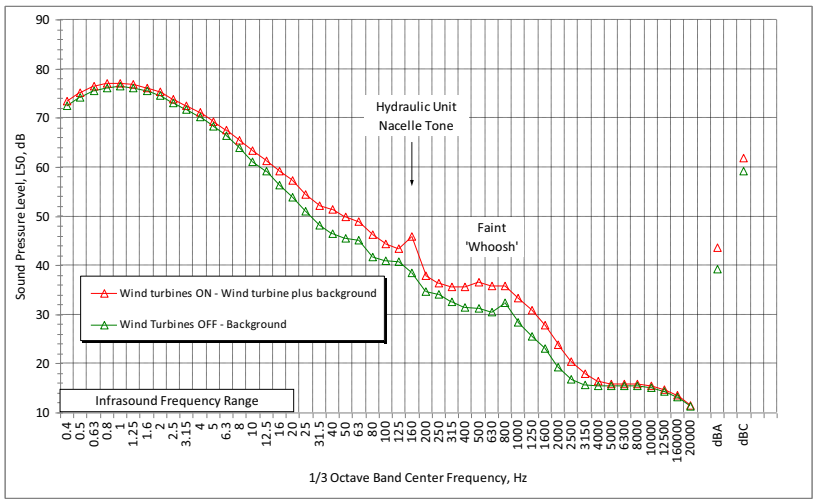


FIGURE 1. ON/OFF sound level spectra and overall levels averaged over three measurement periods each at four locations (12 ON/OFF data sets) at a typical American Midwest wind farm.

Tonal Character

The data in Figure 1 clearly shows a tone (unusual for wind turbine sites) in the 160 Hz band, and this tone is audible at the four measurement locations; more prominently at one than at the others. Our work over many years has given very good results using the definition of a "pure tone" as defined and calculated by the U.S. EPA method[2] to determine prominence by the increase between the tonal one-third octave-band compared to the average of the two adjacent one-third octave-bands. This simple method allows the presence of faint to moderate tones, but if prominence is exceeded, then the tone must be addressed and rectified. We recommend this expedient 1/3 octave band method for assessing tones in wind turbine emissions.

Infrasound and the LFN Issue

The ON/OFF measurements in Figure 1 show virtually no change in measured spectra at very low frequencies when measured using conventional techniques. Figure 2 contains the same data overlaid with measured spectra of estimated pseudo noise in various wind-speed bins. These estimates were collected in a quiet environment in the Mojave Desert with few man-made acoustic sources but at a site with lots of wind. The site is shown in Figure 3 where different windscreens have been tested as part of a volunteer ASA effort in support of a new standard.[3]

Clearly, at the sample site used for measuring the data shown in Figure 1, the very low frequency data, measured both with turbines ON and OFF, are influenced by microphone pseudo noise for the 175 mm windscreen above grade, and these data do *not* represent infrasound or LFN from the wind turbines. What we can deduce from the example site measurements is that whatever low-frequency noise there is that is attributable to the project, is very low in magnitude. The measured data, even with pseudo noise effects, are similar to what one finds in a remote desert specifically chosen to have no man-made sources, and certainly no infrasound.

Figure 4 below shows narrow band spectral measurements at three locations near a residence at a different wind turbine site. These measurements were made at a later date than the wind farm measurements described above, and these measurements use a better microphone wind screening system by placing the microphone on a ground plane covered with a hemispherical wind screen covered in turn with a turbulence screen. The blue and green lines in Figure 4 show the results for two measurement positions outside the residence. The difference between these two is their exposure to wind. The position represented by the blue line was exposed to moderately high wind whereas the position represented by the green line was sheltered from the wind. The smooth blue line exhibits the effects of wind even though these data were measured using the better microphone wind screening system. Note that the real outside tonal infrasonic wind turbine data, shown as a green curve, are 10 dB *below* the wind influenced measurement. The green line shows the wind-turbine blade passage frequency of at 0.7 Hz and harmonics at 1.4, 2.1, 2.8, 3.5 and 4.2 Hz, clearly identifying the source to be from the nearby wind turbines. Note that the very low frequency infrasound passes unimpeded through the house facade.

This discussion illustrates the difficulty of measuring wind turbine emissions or immissions in the presence of wind.

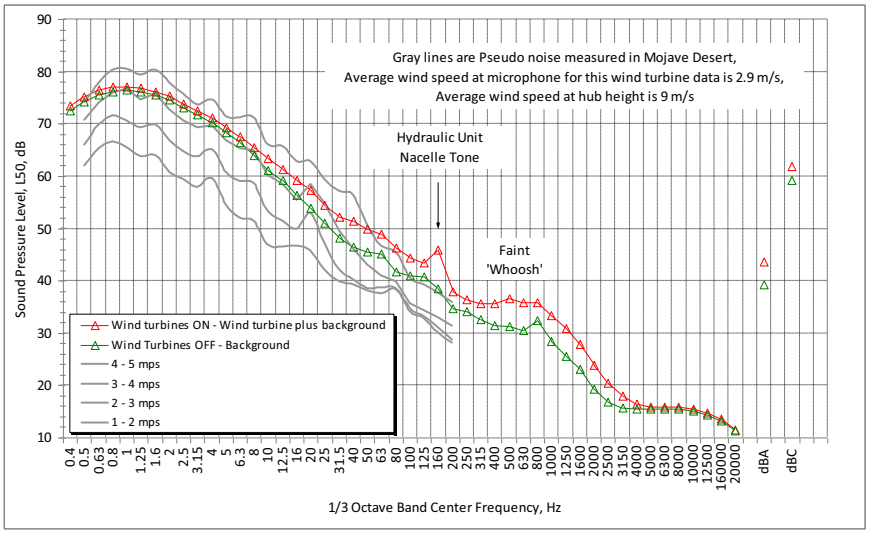


FIGURE 2. ON/OFF sound level spectra and overall levels compared to measured pseudo noise for 175 mm (7 in) wind screen.



FIGURE 3. Comparative windscreen test setup in the Mojave Desert.

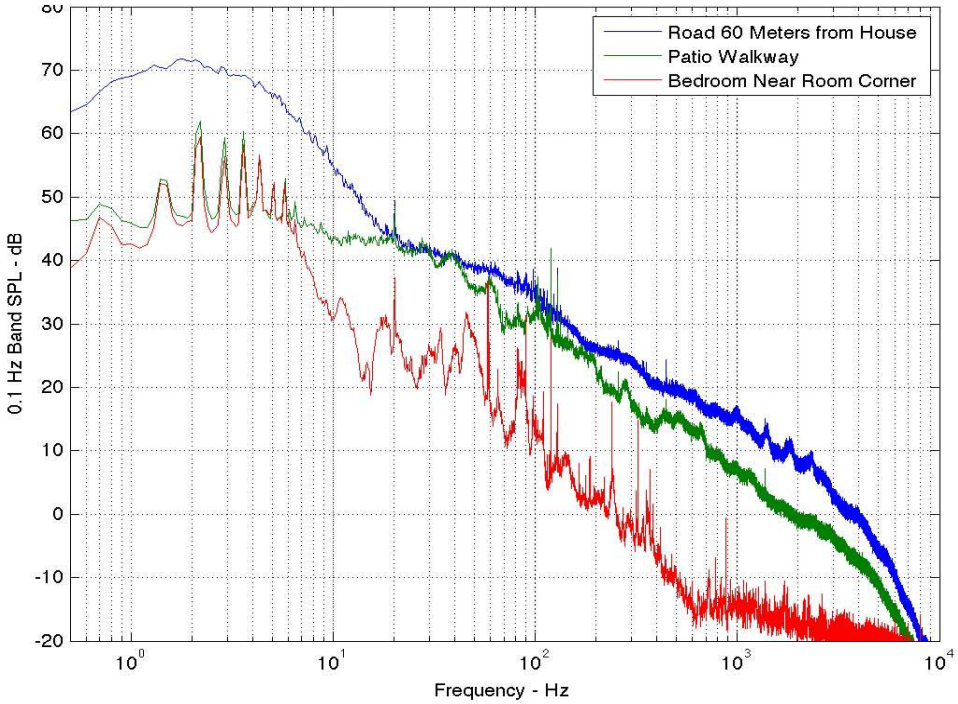


FIGURE 4. Measurement using advanced signal processing and ground plane microphones at three locations near a wind farm.

While the above and similar recently completed careful testing shows that infrasound from wind farms is present and detectable with proper instrumentation, the magnitude is extremely low. For both sample sites, we have shown that infrasound levels are lower than one can measure in the remote Mojave Desert, so it is hard to make a case for any adverse effects from this low-level noise. This result reaffirms our conclusions given 2 years ago at the Rome Wind Turbine Noise Conference.[4] Conversely, the infrasound is tonal in nature, and that may have some influence on its potential effects on residents. The cadre of anti-project consultants claim catastrophic health effects due to infrasound and LFN but with little scientific support. Objective researchers have not established a well-defined causal relationship between turbine emissions and adverse subjective effects.

We can only conclude at this point in time (January 2013) that much more investigative study is required before the need for any low-frequency criteria, is established, and before any regulation on projects should be developed. Moreover, if any such regulations are developed, they will also need to surmount the difficulty of accurately measuring LFN outdoors as discussed above.

ANALYSIS AND CONCLUSIONS FROM DATA – SCHOMER

General

Schomer and Associates believes that three separate criterion are required to properly address the acoustic impact of wind farms: (1) the A-weighted day-night average sound level (DNL) to assess annoyance, (2) the WHO criterion to assess sleep disturbance, and (3) a methodology to assess adverse physiological effects.

Annoyance

The first of these, annoyance, is assessed quite well using the complete methods in ANSI/ASA S12.9 Part 4 and ISO 1996-1. Both of these standards contain and recommend the A-weighted day-night average sound level (DNL) (ISO 1996-1 also recommends day-evening-night average sound level [DENL]), and both include a 10 dB adjustment for a quiet rural setting. It is important to note that the 10 dB adjustment is not because the ambient is quieter in rural areas, but rather, it is there because of the greater expectations of peace and quiet in rural settings.[5, 6] Thus, given the design goal of DNL = 55 dB in residential urban or suburban areas, the design goal in quiet rural areas is simply the 55 dB design goal minus the 10 dB adjustment for a DNL of 45 dB. Note that this derivation is not unique to wind farms; it would apply equally to many noise sources. A DNL of 45 dB can, of course, be realized in a variety of ways, two of which are: (1) an A-weighted level of 45 dB during daytime and a 35 dB A-weighted level during nighttime, or (2) a constant 39 dB during day and night (24 hours per day), which makes the most sense for wind farms.

A DNL of 45 dB should be viewed as a design goal much the same as is done for airports or highways.

That is, the project must be designed to meet or better the design goal everywhere, but at the same time it must be recognized that noise prediction and measurement uncertainties dictate that *sometimes* the predictions will be exceeded. The extent by which a prediction is exceeded is normally a function of the measurement duration and other factors. In my view this uncertainty should be limited to 1 to 2 dB. That is I view the design goal to be 39 dB with a very strong recommendation not to exceed the criterion of 40 dB, and an absolute recommendation not to exceed 41 dB. The design must justifiably be for 39 dB with a margin of safety.

In terms of wind-turbine sound propagation modeling, ISO 9613-2 is frequently used. The above 1dB uncertainty tolerance attached to the 39 dB goal is consistent with general noise prediction requirements in the EU, and the requirements for the proper use of ISO 9613-2. That is, a conservative, "downwind" prediction is typically required in the EU and definitely required for the proper use of ISO 9613-2. With the use of conservative predictions, the small tolerance of 1 to 2 dB should be sufficient to accommodate all but the most unusual sound propagation situations.

Sleep Disturbance

No noise metrics or criteria are known by this author by which to assess the effects of wind-turbine noise on sleep. However, from talking with and meeting with many who have testified that airport noise was awakening them revealed that typically, they awoke for natural reasons and then could not *go back to sleep* because of the noise. Also, once one spouse was awake, it was common for the other spouse to awaken. I see no reason to assume that effects differ between wind-turbines and airports or highways. That is, I do not expect a great deal of verifiable noise-induced awakenings except if and when there are concomitant health effects. So, as with other noise sources, the wind turbine noise generally should not present any sleep disturbance problems so long as the outdoor levels are lower than those recommended by WHO, i.e., maximum indoor nighttime-hour ALEQ of 30 dB. This should always permit a maximum outdoor nighttime ALEQ nearly always greater than 45 dB, but very occasionally between 40 and 45 dB.

Adverse Physiological Effects

Recently, measurements were made at a small wind farm in Shirley, Wisconsin. These measurements were made in the homes of three families who had abandoned their homes because they could not tolerate physiological results caused by the acoustic emissions of wind turbines. This same story is being played out in a seemingly random fashion around the world. Between Hessler Associates and Schomer and Associates, five wind farms are known to have reported problems similar to those at Shirley. Perhaps 1% of wind farms have reported problems like those at Shirley; the remaining 99% have not documented such problems, and the reasons that a small percentage

have these problems are not known. And within those wind farms that have these problems, only a small segment of the population is actually affected to the degree exhibited at Shirley, again on the order of perhaps 1% to 3% of households.

From the residents of Shirley we learned: (1) most residents did not hear the turbines; residents said they could sense when the turbine was on, (2) the effects did not vary with changes in the orientation of the turbines with respect to the homes, (3) the general symptoms of those affected adversely by the wind turbine emissions were virtually the same as symptoms for motion sickness, and (4) afflicted residents were prone to motion sickness.

This told us that (1) the resident had no noise annoyance because they did not hear any wind turbine noise, (2) the wavelength of the "sound" must be large—on the order of 100 m, and (3) there must be a mechanism by which this very low frequency infrasound can cause symptoms of motion sickness in people. To this end, we found a study developed by the Navy showing that linear accelerations at 0.7 Hz were moving well into the nauseogenic region, and that the frequency that induces motion sickness at the lowest acceleration is approximately 0.2 Hz.

The turbine model used in Shirley, the Nordex N-100, is among the largest ever installed in residential areas, and has a blade passage frequency of 0.7 Hz, and a corresponding rotor frequency of 0.23 Hz. The 0.7 Hz was evident in the measurements during times when the turbines were at full power, but not when the turbines were throttled back. The 0.23 Hz was only evident part of the time.

At this point we must note that after over 4000 years of study, no one knows exactly what causes motion sickness or why some people are more affected than others. In the following, we show only that it appears to be possible that an acoustic wave at 0.5 to 0.7 Hz can generate a similar signal in the brain as the signal generated by an acceleration at 0.5 Hz. We do not expect any time soon to be able to predict who will and who will not be affected by low-frequency wind turbine emissions or the mechanism by which they occur any more than we can predict who is affected by motion sickness and who is not, and the mechanism by which people are affected by motion sickness. What we can show is that it appears quite possible for the acoustic emissions from wind turbines to produce this effect in some people. The following discussion analyzes the linear motion sensing function of the ear, and explains how the ear could respond to wind turbine emissions.

In the ear, it is the otoliths that sense horizontal and vertical acceleration of the head, so the question then becomes: "what type of transducer is an otolith and is there a way that it can sense pressure emitted by the wind turbine in addition to its measuring acceleration?" The answer to this question requires research. A theory for how this is possible is in development. So, in this paper we are giving a brief sense of the theory and analysis. Figure 5 shows the ear. We are concerned primarily with the inner ear which is shown in blue in this figure. The inner ear includes the cochlea, which provides a spectral analysis of sound in the frequency range from roughly 10 Hz to 20 kHz. The inner ear also contains the vestibular system, which provides for balance by measuring angular acceleration in three axes using the semi-circular canals (SCC), and by measuring linear acceleration along three axes. In addition to measuring linear acceleration, the otoliths measure the tilt of the head with respect to gravity.

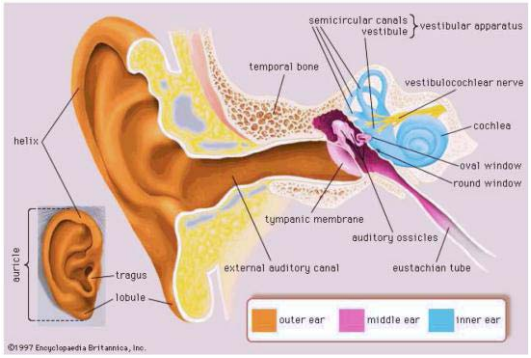


FIGURE 5. The three parts of the ear

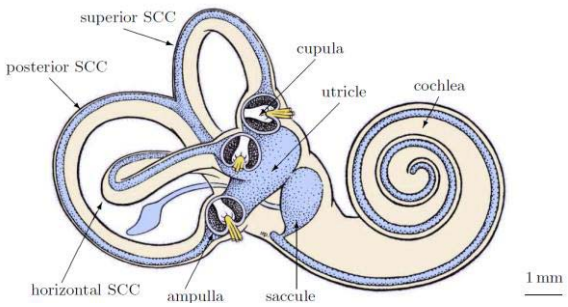


FIGURE 6. The inner ear

Figure 6 shows just the inner ear and includes the cochlea, the 3 SCCs, and the utricle and saccule, which are the two otoliths, one sensing horizontal acceleration, and one sensing vertical acceleration. These six inner ear organs open into the inner space of the inner ear termed the vestibule. The inner part of the inner ear is filled with endolymph fluid which has properties similar to water. A hard bone surrounds the inner ear and the only openings to the "outside" are two windows, the round window, which separates the air-filled middle ear from the endolymph fluid-filled inner ear by a thin membrane, and the oval window, which connects to the stapes, and also separates the inner ear from the middle ear by means of a thin membrane. Normally, the stapes bone causes motion in the endolymph fluid, and this pressure is relieved by the round window. However, at the low frequencies we are

considering here, the middle ear will not be functioning as it does in the audible range, but the slowly varying pressures at 0.7 Hz will enter the middle ear through the eustachian tube and be transferred to the endolymph fluid through the windows. Thus there is a plausible path for the infrasound pressures to reach the inner ear.

A model otolith is shown pictorially in Figure 7. The otoconial layer is a rather dense and reasonably hard outer layer of the otolith. It gets its density from embedded calcium carbonate crystals (otoconia). The otoconial layer creates an inertial force when accelerated owing to its mass. This force is transferred to the gel layer (cupular membrane) which then bends the hair cells causing them to transmit signals to the brain. So the fundamental measurement by the otolith is the inertial force of the otoconial layer; the otolith is measuring force. It remains to be determined exactly how pressure in the vestibule actually causes the hair cells to transmit a signal to the brain.

In summary, what is being said is that the wind-turbine acoustic wave at the very low blade passage frequency appears to have a possible pathway to the sensors in the inner ear, and that the otoliths fundamentally are sensing pressure. It is not yet clear how the pressure is transferred to otoliths so as to create shear forces in the cupular membrane. Possibly, this pathway to the inner ear and the pressure response of the otoliths can be demonstrated and validated in the laboratory by measuring signals to the brain in some surrogate animal. But the bottom line, which must be stressed, is that nobody knows what causes some people to get motion sickness, and what prevents most from getting motion sickness; likewise, we do not know why some people become sick from wind turbine emissions, and most others do not. What we do know is that in both cases, the sickness is real for those who are sensitive, and that the model presented here has potential for explaining how some are affected.

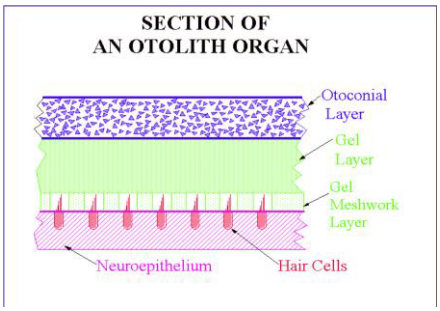


FIGURE 7. Section of a model otolith organ

CONCLUSIONS

1. The Hessler and the Schomer goals for the A-weighted wind farm levels are virtually identical at 40 and 39 dB, respectively. Hessler, based mainly on extensive observations of community response from installed wind farms, suggests 45 dBA as a criterion or legal limit, while Schomer believes the limit should be quite close to 39 dB. In conclusion, the authors agree within about 2 dB that no extensive adverse response in the form of voiced annoyance is expected at low wind turbine levels; per Hessler these levels are low forties, e.g. 42 dB, and per Schomer, these levels are very low forties, e.g. 40 dB, at the closest residences. The probability of complaints increases as the average level approaches 45 dBA.

2. The authors agree that sleep disturbance issues should not be a problem as long as the outdoor criterion is met.

3. The difference between quiet, rural A-weighted background levels and full power wind-turbine levels has been measured over seven months in a Western state and does not appear to be larger than 10 to 15dB so there is no basis for making the claim that wind-farms create a huge jump over the ambient.

4. Schomer shows that it appears possible for the acoustic emission of a wind turbine to create a sense of motion in the human brain, but this appears to be documented at about 1% or less of wind farms, and only a small percentage of households (1 to 3 %) appear to be affected. Research is clearly needed to understand why this small minority of wind farms exists, what makes them different, and what makes a small percentage of the population at these wind farms sensitive when most are not.

5. Hessler shows that it is very easy to make a completely incorrect measurement (on the high side) of infrasound unless great care is taken to protect the measuring system from pseudo noise effects.

6. Both Hessler and Schomer strongly agree and urge that research be undertaken for the explicit purpose of understanding the issues related to the very low-frequency acoustic emissions of wind turbines found to emit these very low frequencies including, but not limited to:

(1) How are these acoustic emissions generated? Under what weather conditions? etc.

(2) Are these emissions unique to the N-100 or are they more widespread? If widespread, then the knowledge gained on the generation of low-frequency acoustic emissions should be used as a starting point in the development of a revised IEC Standard for the measurement of wind turbine emissions.
(3) What are the propagation characteristics of an acoustic wave in the two decades from 0.08 Hz to 8 Hz?
(4) How does the very low-frequency sound affect people?
(5) Why do some wind farms have health problems while most do not?
(6) Why are some people affected while most, apparently, are not?
(7) How can the health effects be mitigated or eliminated?
(8) Are there feasible wind turbine design and/or layout changes that can ameliorate the situation?
(9) Etc., etc., etc.

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A Cooperative Measurement Survey and Analysis of Low Frequency and Infrasound at the Shirley Wind Farm in Brown County, Wisconsin



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1.0_Introduction

Clean Wisconsin is a nonprofit environmental advocacy organization that works to protect Wisconsin's air and water and to promote clean energy. As such, the organization is generally supportive of wind projects. Clean Wisconsin was retained by the Wisconsin Public Service Commission (PSC) to provide an independent review of a proposed wind farm called the Highlands Project to be located in St. Croix County, WI (WI PSC Docket 2535-CE-100). Clean Wisconsin in turn retained Hessler Associates, Inc. (HAI) to provide technical assistance.

During the course of the hearings, attorneys representing groups opposed to the Highlands project, presented witnesses that lived near or within the Shirley Wind project in Brown County, WI. The Shirley wind project is made up of eight Nordex100 wind turbines that is one of the turbine models being considered for the Highlands projects. These witnesses testified that they and their children have suffered severe adverse health effects to the point that they have abandoned their homes at Shirley. They attribute their problems to arrival of the wind turbines. David Hessler, while testifying for Clean Wisconsin, suggested a sound measurement survey be made at the Shirley project to investigate low frequency noise (LFN) and infrasound (0-20 Hz) in particular.

Partial funding was authorized by the PSC to conduct a survey at Shirley and permission for home entry was granted by the three homeowners. The proposed test plan called for the wind farm owner, Duke Power, to cooperate fully in supplying operational data and by turning off the units for short intervals so the true ON/OFF impact of turbine emissions could be documented. Duke Power declined this request due to the cost burden of lost generation, and the homeowners withdrew their permission at the last moment because no invited experts on their behalf were available to attend the survey.

Clean Wisconsin, their consultants and attorneys for other groups all cooperated and persisted and the survey was rescheduled for December 4 thru 7, 2012. Four acoustical consulting firms would cooperate and jointly conduct and/or observe the survey. Channel Islands Acoustics (ChIA) has derived modest income while Hessler Associates has derived significant income from wind turbine development projects. Rand Acoustics is almost exclusively retained by opponents of wind projects. Schomer and Associates have worked about equally for both proponents and opponents of wind turbine projects. However, all of the firms are pro-wind if proper siting limits for noise are considered in the project design.

The measurement survey was conducted on schedule and this report is organized to include four Appendices A thru D where each firm submitted on their own letterhead a report summarizing their findings. Based on this body of work, a consensus is formed where possible to report or opine on the following:

- Measured LFN and infrasound documentation
- Observations of the five investigators on the perception of LFN and infrasound both outside and inside the three residences.
- Observations of the five investigators on any health effects suffered during and after the 3 to 4 day exposure.
- Recommendations with two choices to the PSC for the proposed Highlands project
- Recommendations to the PSC for the existing Shirley project

2.0_Testing Objectives

Bruce Walker employed a custom designed multi-channel data acquisition system to measure sound pressure in the time domain at a sampling rate of 24,000/second where all is collected under the same clock. The system is calibrated accurate from 0.1 Hz thru 10,000 Hz. At each residence, channels were cabled to an outside wind-speed anemometer and a microphone mounted on a ground plane covered with a 3 inch hemispherical wind screen that in turn was covered with an 18 inch diameter and 2 inch thick foam hemispherical dome (foam dome). Other channels inside each residence were in various rooms including basements, living or great rooms, office/study, kitchens and bedrooms. The objective of this set-up was to gather sufficient data for applying advanced signal processing techniques. See Appendix A for a Summary of this testing.

George and David Hessler employed four off-the-shelf type 1 precision sound level meter/frequency analyzers with a rated accuracy of +/- 1 dB from 5 Hz to 10,000 Hz. Two of the meters were used as continuous monitors to record statistical metrics for every 10 minute interval over the 3 day period. One location on property with permission was relatively close (200m) to a wind turbine but remote from the local road network to serve as an indicator of wind turbine load, ON/OFF times and a crude measure of high elevation wind speed. See cover photo. This was to compensate for lack of Duke Power's cooperation. The other logging meter was employed at residence R2, the residence with the closest turbines. The other two meters were used to simultaneously measure outside and inside each residence for a late night and early morning period to assess the spectral data. See Appendix B for a Summary of this testing.

Robert Rand observed measurements and documented neighbor reports and unusual negative health effects including nausea, dizziness and headache. He used a highly accurate seismometer to detect infrasonic pressure modulations from wind turbine to residence. See Appendix C for Rob's Summary.

Paul Schomer used a frequency spectrum analyzer as an oscilloscope wired into Bruce's system to detect in real time any interesting occurrences. Paul mainly circulated around observing results and questioning and suggesting measurement points and techniques. See Appendix D for Paul's Summary.

Measurements were made at three unoccupied residences labeled R1, R2 and R3 on Figure 2.1. The figure shows only the five closest wind turbines and other measurement locations. All in all, the investigators worked very well together and there is no question or dispute whatsoever about measurement systems or technique and competencies of personnel. Of course, conclusions from the data could differ. Mr. M. Hankard, acoustical consultant for the Highland and Shirley projects, accompanied, assisted and observed the investigators on Wednesday, 12/5.



Figure 2.1: *Aerial view showing sound survey locations*

The four firms wish to thank and acknowledge the extraordinary cooperation given to us by the residence owners and various attorneys.

3.0_Investgator Observations

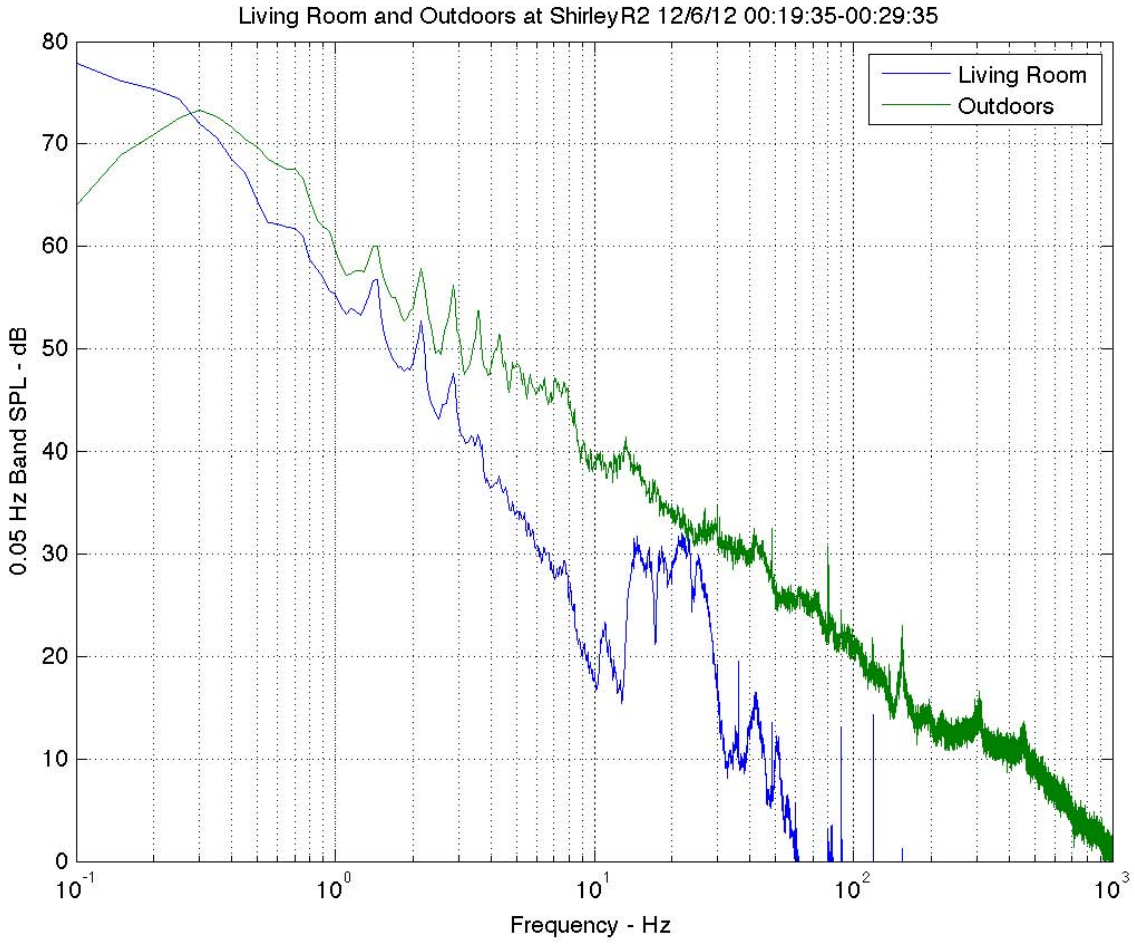
Observations from the five investigators are tabulated below: It should be noted the investigators had a relatively brief exposure compared to 24/7 occupation.

AUDIBILITY OUTSIDE RESIDENCES	
	Observations
Bruce Walker	Could detect wind turbine noise at R1, easily at R2, but not at all at R3
George Hessler	Could detect wind turbine noise at R1, easily at R2, but not at all at R3
David Hessler	Could detect wind turbine noise at R1, easily at R2, but not at all at R3
Robert Rand	Could detect wind turbine noise at all residences
Paul Schomer	Not sure at R1 but could detect wind turbine noise at R2, not at all at R3
AUDIBILITY INSIDE RESIDENCES	
	Observations
Bruce Walker	Could not detect wind turbine noise inside any home
George Hessler	Could not detect wind turbine noise inside any home
David Hessler	Could faintly detect wind turbine noise in residence R2
Robert Rand	Could detect wind turbine noise inside all three homes
Paul Schomer	Could not detect wind turbine noise inside any home
EXPERIENCED HEALTH EFFECTS	
	Observations
Bruce Walker	No effects during or after testing
George Hessler	No effects during or after testing
David Hessler	No effects during or after testing
Robert Rand	Reported ill effects (headache and/or nausea while testing and severe effects for 3+ days after testing
Paul Schomer	No effects during or after testing

4.0_Conclusions

This cooperative effort has made a good start in quantifying low frequency and infrasound from wind turbines.

Unequivocal measurements at the closest residence R2 are detailed herein showing that wind turbine noise is present outside and inside the residence. Any mechanical device has a unique frequency spectrum, and a wind turbine is simply a very very large fan and the blade passing frequency is easily calculated by RPM/60 x the number of blades, and for this case; 14 RPM/60 x 3 = 0.7 Hz. The next six harmonics are 1.4, 2.1, 2.8, 3.5, 4.2 & 4.9 Hz and are clearly evident on the attached graph below. Note also there is higher infrasound and LFN inside the residence in the range of 15 to 30 Hz that is attributable to the natural flexibility of typical home construction walls. This higher frequency reduces in the basement where the propagation path is through the walls plus floor construction but the tones do not reduce appreciably.



Measurements at the other residences R1 and R3 do not show this same result because the increased distance reduced periodic turbine noise closer to the background and/or turbine loads at the time of these measurements resulted in reduced acoustical emission. Future testing should be sufficiently extensive to cover overlapping turbine conditions to determine the decay rate with distance for this ultra low frequency range, or the magnitude of measurable wind turbine noise with distance.

The critical questions are what physical effects do these low frequencies have on residents and what LFN limits, if any, should be imposed on wind turbine projects. The reported response at residence R2 by the wife and their child was extremely adverse while the husband suffered no ill effects whatsoever, illustrating the complexity of the issue. The family moved far away for a solution.

A most interesting study in 1986 by the Navy reveals that physical vibration of pilots in flight simulators induced motion sickness when the vibration frequency was in the range of 0.05 to 0.9 Hz with the maximum (worst) effect being at about 0.2 Hz, not too far from the blade passing frequency of future large wind turbines. If one makes the leap from physical vibration of the body to physical vibration of the media the body is in, it suggests adverse response to wind turbines is an acceleration or vibration problem in the very low frequency region.

The four investigating firms are of the opinion that enough evidence and hypotheses have been given herein to classify LFN and infrasound as a serious issue, possibly affecting the future of the industry. It should be addressed beyond the present practice of showing that wind turbine levels are magnitudes below the threshold of hearing at low frequencies.

5.0_Recommendations

5.1_General

We recommend additional study on an urgent priority basis, specifically:

- A comprehensive literature search far beyond the search performed here under time constraints.
- A retest at Shirley to determine the decay rate of ultra low frequency wind turbine sound with distance with a more portable system for measuring nearly simultaneously at the three homes and at other locations.
- A Threshold of Perception test with participating and non-participating Shirley residents.

5.2_For the Highlands Project

ChIA and Rand do not have detail knowledge of the Highland project and refrain from specific recommendations. They agree in principle to the conclusions offered herein in Section 4.0.

Hessler Associates has summarized their experience with wind turbines to date in a peer-reviewed Journal[1] and have concluded that adverse impact is minimized if a design goal of 40 dBA (long term average) is maintained at all residences, at least at all non-participating residences. To the best of their knowledge, essentially no annoyance complaints and certainly no severe health effect complaints, as reported at Shirley, have been made known to them for *all* projects designed to this goal.

[1] Hessler G., & David, M., "Recommended noise level design goals and limits at residential receptors for wind turbine developments in the United States", Noise Control Engineering Journal, 59(1), Jan-Feb 2011

Schomer and Associates, using an entirely different approach have concluded that a design goal of 39 dBA is adequate to minimize impact, at least for an audible noise impact. In fact, a co-authored paper[2] is planned for an upcoming technical conference in Montreal, Canada.

Although there is no explicit limit for LFN and infrasound in these A-weighted sound levels above, the spectral shape of wind turbines is known and the C-A level difference will be well below the normally accepted difference of 15 to 20 dB. It may come to be that this metric is not adequate for wind turbine work but will be used for the time being.

Based on the above, Hessler Associates recommends approval of the application if the following Noise condition is placed on approval:

> With the Hessler recommendation, the long-term-average (2 week sample) design goal for sound emissions attributable to the array of wind turbines, exclusive of the background ambient, at all non-participating residences shall be 39.5 dBA or less.

Schomer and Associates recommends that the additional testing listed in 5.3 be done at Shirley on a very expedited basis with required support by Duke Energy prior to making a decision on the Highlands project. It is essential to know whether or not some individuals can perceive the wind turbine operation at R1 or R3. With proper resources and support, these studies could be completed by late February or early March. If a decision cannot be postponed, then Schomer and Associates recommends a criterion level of 33.5 dB. The Navy's prediction of the nauseogenic region (Schomer Figure 6 herein) indicates a 6 dB decrease in the criterion level for a doubling of power such as from 1.25 MW to 2.5 MW.

> With the Schomer recommendation, and in the presence of a forced decision, the long-term-average (2 week sample) design goal for sound emissions attributable to the array of wind turbines, exclusive of the background ambient, at all non-participating residences shall be 33.5 dBA or less.

There is one qualifier to this recommendation. The Shirley project is unique to the experience of the two firms in that the Nordex100 turbines are very high rated units (2.5 MW) essentially not included in our past experiences. HAI has completed just one project, ironically named the Highlands project in another state that uses both Nordex 90 and Nordex 100 units in two phases. There is a densely occupied Town located 1700 feet from the closest Nordex 100 turbine. The president and managers of the wind turbine company report “no noise issues at the site”.

Imposing a noise limit of less than 45 dBA will increase the buffer distances from turbines to houses or reduce the number of turbines so that the Highlands project will *not* be an exact duplication of the Shirley project. For example, the measured noise level at R2 is approximately 10 dBA higher than the recommendation resulting in a subjective response to audible outside noise as twice as loud. Measured levels at R1 and R3 would comply with the recommendation.

We understand that the recommended goal is lower than the limit of 45 dBA now legislated, and may make the project economically unviable. In this specific case, it seems justified to the two firms to be conservative (one more than the other) to avoid a duplicate project to Shirley at Highlands because there is no technical reason to believe the community response would be different.

[2] Schomer, P. & Hessler, G., “Criteria for wind-turbine noise immissions”, ICA, Montreal, Canada 2013

5.3_For the Shirley Project

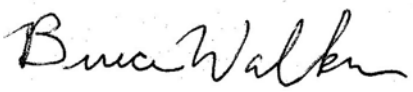
The completed testing was extremely helpful and a good start to uncover the cause of such severe adverse impact reported at this site. The issue is complex and relatively new. Such reported adverse response is sparse or non-existent in the peer-reviewed literature. At least one accepted paper at a technical conference[3] has been presented. There are also self-published reports on the internet along with much erroneous data based on outdated early wind turbine experience.

A serious literature search and review is needed and is strongly recommended. Paul Schomer, in the brief amount of time for this project analysis, has uncovered some research that *may* provide a probable cause or direction to study for the reported adverse health effects. We could be close to identifying a documented cause for the reported complaints but it involves much more serious impartial effort.

An important finding on this survey was that the cooperation of the wind farm operator is absolutely essential. Wind turbines must be measured both ON and OFF on request to obtain data under nearly identical wind and power conditions to quantify the wind turbine impact which could not be done due to Duke Power's lack of cooperation.

We strongly recommend additional testing at Shirley. The multi-channel simultaneous data acquisition system is normally deployed within a mini-van and can be used to measure immissions at the three residences under the identical or near identical wind and power conditions. In addition, seismic accelerometer and dedicated ear-simulating microphones can be easily accommodated. And, ON/OFF measurements require the cooperation of the operator.

Since the problem may be devoid of audible noise, we also recommend a test as described by Schomer in Appendix D to develop a "Threshold of Perception" for wind turbine emissions.



Bruce Walker



George F. Hessler Jr.



David M. Hessler



Robert Rand



Paul Schomer

[3] Ambrose, S. E., Rand, R. W., Krogh, C. M., "Falmouth, Massachusetts wind turbine infrasound and low frequency noise measurements", Proceedings of Inter-Noise 2012, New York, NY, August 19-22.

Wind Turbine Noise and Human Health:
A Four-Decade History of Evidence that Wind Turbines Pose Risks*

Jerry L. Punch,[i] Richard R. James[ii]

Abstract

Many expert-review panels and some individual authors, in the U.S. and internationally, have taken the position that there is little literature to support concerns about adverse health effects (AHEs) from noise emitted by industrial wind turbines (IWTs). In this review, we systematically examine the literature that bears on some of the particular claims that are commonly made in support of the view that a causal link is non-existent. Investigation of the veracity of those claims requires that multiple topics be addressed, and the following specific topics were targeted for this review: (1) emissions of infrasound and low-frequency noise (ILFN) by IWTs, (2) the perception of ILFN by humans, (3) the evidentiary bases for establishing a causative link between IWTs and AHEs, as well as the physiological bases for such a link, (4) recommended setback distances and permissible noise levels, (5) the relationship between annoyance and health, (6) alternative causes of the reported health problems, (7) recommended methods for measuring infrasound, (8) foundations for establishing a medical diagnosis of AHEs due to IWTs, (9) research designs useful in establishing causation, (10) the role of psychological expectations as an explanation for the reported adverse effects, (11) the prevalence of AHEs in individuals exposed to IWTs, and (12) the scope and quality of literature addressing the link between IWT noise and AHEs. The reviewed evidence overwhelmingly supports the notion that acoustic emissions from IWTs is a leading cause of AHEs in a substantial segment of the population.

*Revised October 21, 2016

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Key Words: Adverse health effects, human health, industrial wind turbines, infrasound, inner ear, low-frequency noise, wind turbine noise

Introduction

Whether infrasound and low-frequency noise (ILFN) from industrial wind turbines (IWTs) is detrimental to human health is currently a highly controversial topic. Advocates of industrial-

scale wind energy assert that there is no credible scientific evidence of a causal relationship, while many reputable professionals believe that there is sufficient scientific evidence to establish a causal link between IWTs and detrimental health effects *for a non-trivial percentage of individuals who reside in communities hosting IWTs*. The veracity of claims regarding the effects on human health is being debated on a global scale by the wind industry; individuals living near IWTs; attorneys and expert witnesses in courts of law; print and web-based media; documentary films (which currently include *Windfall*, *Wind Rush*, and *Down Wind*); and scientists and other professionals in government reports, on the Internet, and in scientific and professional papers presented at society meetings and published in peer-reviewed journals.

The debate surrounding IWTs extends to many controversial issues, including physical safety, visibility, shadow flicker, and threats to property values and wildlife. Many problems involving wind turbines, including mechanical failures, accidents, and other mishaps, have been discussed on the Internet. At least one website has extensively catalogued these incidents,[1] and the large number of incidents reported by that site is described by its webmaster as grossly underestimating the actual number of documented incidents. The most vigorous debate, however, centers on ILFN and its effects on human health.

The overall purpose of this article is to provide a systematic review of legitimate sources that bear directly and indirectly on the question of the extent to which IWT noise leads to the many health complaints that are being attributed to it. The authors accessed most articles and reports referenced in this review by employing Google, Google Scholar, and PubMed as the primary search engines. Our basic aim was to provide a comprehensive and representative—though not exhaustive—review of the literature that is relevant to many of the claims made by wind industry advocates. An exhaustive review is an elusive and impractical goal, given the large volume of directly and indirectly related work done in this area over the past several decades and the current pace of such work.

The role of evidentiary facts

Adverse impacts on people and property are among the most contentious issues that are typically the focus of legal proceedings involving IWT noise. Based on the forensic and research experiences of the authors, we believe that a resolution of the controversial aspects of this debate will require not just relevant scientific research, but rather a series of legal judgments based on the effective evaluation and interpretation of the existing research. In fact, much research and some already-rendered legal decisions show convincingly that some segments of the population suffer damaging effects from exposure to wind turbine noise (WTN). What is needed among the scientific community, local and national governmental agencies, and political leaders, is honest

discourse about methods for reducing carbon emissions in ways that do not turn some rural communities into *sacrifice zones*.[2, 3]

Many symptoms and complaints of adverse health effects (AHEs) related to IWTs have been self-reported by individuals living near wind turbines and described in published case reports. There is a group of core symptoms and complaints, however—including sleep disturbance, headache, dizziness, vertigo, and ear pressure or pain—that are remarkably common worldwide. Dr. Nina Pierpont was the first to report these core symptoms in a case series,[4] and she termed these core symptoms *Wind Turbine Syndrome*. For the sake of brevity, we will on occasion refer to Wind Turbine Syndrome as a substitute for this group of common symptoms and complaints, even though the phrase itself is currently not utilized as a medical diagnostic entity.

Numerous reviews of the literature have already been published that allege that there is no credible link between WTN emissions and AHEs. Those reviews have typically been sanctioned by state or provincial government agencies that have missions to support the development of wind energy, and which in turn appoint *expert panels* whose members hold views that regularly favor the wind industry and, therefore, may have conflicting interests. Too often, in the opinion of the authors, such reviews are biased in support of political policy decisions that promote the financial interests of wind developers, and perceived financial benefits to local communities, over the common good. None of those reviews has been specifically targeted toward describing or explaining the relationship between exposure to complex, dynamically modulated infra- and low-frequency sound from wind turbines or other industrial sources (e.g., noise-induced Sick Building Syndrome) and AHEs. Our primary objective in this article is to review the existing scientific and professional literature that is frequently overlooked in such reviews conducted by wind energy proponents. Such literature can be useful in legal proceedings in questioning and articulating the available evidence of risks to people who live in the footprint of utility-scale wind energy projects.

Some of the published reviews have been criticized for their failure to meet the standards noted by Horner,[5] who reminds us that readers should regard literature reviews with caution, and employ an audit strategy in evaluating their completeness, accuracy, and objectivity. Authors, including ourselves, have an inherent obligation to ensure that such reviews cite all known legitimate sources that serve as the basis for their views of the issues and reflect accurately the contents of all references cited.

Some courts of law in the U.S. and other countries now tend to rely heavily on testimony that adheres to the principle that proof of evidence of causation of AHEs from IWTs be based on the

peer-reviewed literature. Presumably, that practice in the U.S. stems at least partially from advocacy by the Office of Management and Budget[6] that internal and external government science documents be peer-reviewed government-wide for the purpose of increasing the quality and credibility of scientific information generated by the federal government. Peer-review standards are considered paramount in that effort.

While the peer-review process has many virtues, it also has its shortcomings, which are well known. For example, not all journals or individual reviews of submitted manuscripts are of equal quality, as specific journals and specific reviewers may have ideological or philosophical biases, which may or may not be surmised from the journals' mission statements. Nonetheless, the peer-review process is one of the most widely acknowledged ways to control the quality of published works. We contend, however, that there are other credible sources of information, even though those sources may not have been subjected to as rigorous a peer-review process as that employed by many scientific journals. Such sources include papers presented at meetings of scientific and professional societies; reports and other documents commissioned by state and local governmental agencies, especially if such documents are authored by independent researchers; legal testimony given under oath by qualified scientists and professionals; and some information available on the Internet, especially if written by professionals who have reputable track records in their disciplines. Although we will emphasize the peer-reviewed literature in this article, we will also cite some of these additional sources as authoritative. Our citing of selected non-peer-reviewed reports, with a few exceptions, is based on our familiarity with the professional reputations of the authors of those reports, normally earned through publication of a solid body of work in the peer-reviewed literature and by acceptance of their work by other professionals and peers. Typically, individuals so referenced enjoy positive national or international recognition in their respective fields of expertise.

We begin this review by calling attention to a quote from geophysicist Marcia McNutt, who once headed the U.S. Geological Survey and is now editor of the prestigious journal *Science*. McNutt has been quoted as stating: "Science is not a body of facts. Science is a method for deciding whether what we choose to believe has a basis in the laws of nature or not."[7] In fact, science consists of a variety of overlapping methodological approaches, which must be interwoven to discover answers to complex problems. That conviction has guided our attempt to re-examine the controversial topic at hand.

Review of wind industry claims and positions

Our review is organized by summarizing the past and present literature that addresses each of 12 selected statements, listed below, that encapsulate specific claims, or positions, commonly taken by advocates for the wind industry:

1. Infrasound is not an issue, as infrasound generated by wind turbines is not perceptible to humans.
2. There is nothing unique about wind turbine noise, as infrasound and low-frequency noise are commonly produced by the body and by many environmental sources.
3. There is no evidence that wind turbine noise, audible or inaudible, is the cause of adverse health effects in people, and there are no physiological mechanisms to explain how inaudible acoustic energy can be harmful.
4. Setback distances of 1,000-1,500 ft. (approximately 0.3-0.5 km) are sufficiently safe to protect humans from harm, regardless of height or other physical characteristics of the IWTs.
5. Annoyance is a nuisance, but it is not a health issue.
6. Noise cannot account for all of the complaints of people living in the vicinity of wind turbines; there must be another, unknown reason for the complaints.
7. Infrasound from wind turbines is sufficiently correlated to the A-weighted sound emissions to allow an A-weighted model to be used to predict how much infrasound is present in homes.
8. Wind Turbine Syndrome has not been accepted as a diagnostic entity by the medical profession, so medical professionals cannot diagnose or treat it.
9. Peer-reviewed epidemiological literature is the only acceptable basis for proving a causative relationship between wind turbine noise and adverse health effects.
10. The nocebo effect, a manifestation of psychological expectations, explains why people complain of adverse health effects when living near wind turbines.
11. Only relatively few people, if any, are adversely impacted by wind turbine noise, and the majority have no complaints.
12. There is no evidence in the literature to support a causative link between wind turbine noise and adverse effects.

Statement 1: Infrasound is not an issue, as infrasound generated by wind turbines is not perceptible to humans.

The argument that infrasound as a cause of AHEs is not an issue has been advanced in the published literature primarily by Dr. Geoff Leventhall,[8, 9] with support from several other researchers. Those researchers have dismissed the influence of infrasound on human health by describing it as not exceeding the thresholds of audibility, and therefore ineffectual, without noting that those thresholds were established using steady pure tones instead of the complex, dynamically modulated tones emitted by wind turbines. Leventhall claims that infrasound from wind turbines is not a problem and that it is misunderstood largely because of mischaracterization by the media and by "those with limited knowledge" (p. 29). He states that there may be noise problems associated with wind turbines, but that such problems are due to *audible* swishing sounds due to interactions of the blades with the tower. Supporters of wind energy have generally followed Leventhall's lead, although his own research has shown conclusively that exposure to modulated ILFN produced by large industrial equipment, including heating, ventilating and air-conditioning (HVAC) systems, leads to mental fatigue, lack of concentration, headaches, reduced performance, and work dissatisfaction. Indeed, there is a long history of noise-induced *Sick Building Syndrome*, stemming from investigations in the 1970s-1990s of the effects of low-frequency noise on knowledge workers (see James[10] and Schwartz[11] for reviews of that research). Leventhall[12] stated:

> "Low frequency noise causes extreme distress to a number of people who are sensitive to its effects. Such sensitivity may be a result of heightened sensory response within the whole or part of the auditory range or may be acquired. The noise levels are often low, occurring in the region of the hearing threshold, where there are considerable individual differences" (p. 4).

Later in the same document, he states:

> "There is no doubt that some humans exposed to infrasound experience abnormal ear, CNS (central nervous system), and resonance induced symptoms that are real and stressful. If this is not recognised by investigators or their treating physicians, and properly addressed with understanding and sympathy, a psychological reaction will follow and the patient's problems will be compounded. Most subjects may be reassured that there will be no serious consequences to their health from infrasound exposure and *if further exposure is avoided* (emphasis added) they may expect to become symptom free" (p. 60).

Leventhall has also stated that the ear is designed to protect us from infrasound and that, in essence, *If you can't hear it, you can't feel it.*[13, 14] The idea that ILFN from wind turbines does

not affect health was further reinforced in a 2009 white paper co-authored by Leventhall and sanctioned by the wind industry,[15] to be reviewed later.

The position that infrasound from wind turbines is not harmful to humans because it is not perceptible to the human ear also has support from Møller & Pedersen,[16] who investigated noise emissions from 48 wind turbines with electrical output capacities of between 2.3 and 3.6 MW. They stated:

> "The turbines do emit infrasound (sound below 20 Hz), but levels are low when human sensitivity to these frequencies is accounted for. Even close to the turbines, the infrasonic sound pressure level is much below the normal hearing threshold, and infrasound is thus not considered as a problem with turbines of the investigated size and construction" (pp. 3742-3743).

Evans et al[17] found that levels of infrasound measured at two residential locations near wind projects in South Australia were within the range of infrasound levels experienced in other urban and rural environments. Although Colby et al[15] and Bolin et al[18] dismiss wind turbines as a cause of AHEs, they acknowledge that turbines emit ILFN. A number of authors indicate that large turbines emit more such noise than smaller turbines (see, for example, Bolin et al[18] and Møller & Pedersen.[16]) George Kamperman (personal communication, 2009) has concluded that the amount of low-frequency noise generated by IWTs increases by 3–5 dB for every megawatt of electrical power generated.

Evidence that IWTs produce perceptible levels of infrasound, in addition to audible low-frequency noise above 20 Hz, has been available since the 1980s. In their seminal research on large-scale wind turbines, which was funded by the U.S. Department of Energy, Kelley et al[19] measured noise levels emitted by a DOE/NASA MOD-l wind turbine operating near Boone, North Carolina, in response to noise complaints. They concluded that:

> "…one of the major causal agents responsible for the annoyance of nearby residents by wind turbine noise is the excitation of highly resonant structural and air volume modes by the coherent, low frequency sound radiated by large wind turbines. Further, there is evidence that the strong resonances found in the acoustic pressure field within rooms actually measured indicates a coupling of subaudible energy to human body resonances at 5, 12, and 17-25 Hz, resulting in a sensation of whole-body vibration" (p. 120).

Those conclusions were further strengthened in a subsequent report.[20] In a second follow-up report, also funded by the Department of Energy, Kelley[21] electronically simulated three interior environments resulting from low-frequency acoustical loads radiated from both single and grouped upwind and downwind turbines. (These terms refer to the placement of the rotor and

blades with respect to the tower. With upwind designs, the more contemporary design, the airflow strikes the blades before striking the tower, and with downwind designs, the airflow strikes the tower before striking the blades.) Relatively low levels of low-frequency acoustic noise from a single, 2-MW MOD-1 wind turbine led to annoyance of residents of the surrounding community, largely through interaction with residential structures. Most importantly, Kelley found that the turbines radiated their peak sound power in the infrasonic range, typically between 1 and 10 Hz. An extensive investigation revealed that the reported annoyance was the result of a coupling of the turbine's impulsive low-frequency acoustic energy into the structures of some of the surrounding homes, and that annoyance was "frequently confined to *within the home itself*" (p. 1). Despite these early findings that IWTs generate infrasonic levels that produce acoustic energy, vibrations, and resonances that affect people in their homes, the wind industry has chosen to regard them as insignificant or only applicable to obsolete, downwind wind turbine designs.

The basis for discounting the research by Kelley and associates is predicated on the assumption that pressure changes of equal levels to wind turbines occur in natural environments and do not cause any similar complaints. The authors find that their own experiences with rapidly changing pressures have caused similar experiences. If these rather short-duration sensations were to continue over days, weeks, and months, as they do for people living near wind projects, they would likely find them to be unacceptable.

The primary argument of people who deny any effects is encapsulated by Leventhall[9] in his *Child on a Swing* example:

> "A child on a swing experiences infrasound at a level of around 110dB and frequency 0.5Hz, depending on the suspended length and the change in height during the swing" (p. 30).

The inference is that because children often swing on swings, there are no adverse sensations. That fails to acknowledge that the experience of swinging is one that elicits many visceral sensations that are pleasant to the child as long as the sensations stop when the swing stops. The example, however, misses one major point. The duration and motion of the swing provide a smooth, sinusoidal pressure change that has two high pressure points (at the top of each swing) that occur over a period of several seconds or so. This is a completely different experience to that of pressure pulses lasting 100 msec or less. If one considers a swing with a period of 3.5 sec, there is a pressure change at 1.75 sec, resulting in a frequency of 0.57 Hz. The pressure changes are approximately 120 dB peak-to-peak, or 110 dB rms. The overall G-weighted value in this example is -60 dB, with a smooth pressure change, resulting in a net 50 dBG for the child, versus

the 75 dBG experienced as a pulse for a person living near a wind turbine (calculations provided by Malcolm Swinbanks, personal communication, 2010).

The assertion that wind turbine infrasound immissions, especially when received in the bedroom of a quiet home, must be at or above the threshold of hearing to cause adverse effects has been disproved, as noted above in the works of Kelley and colleagues in the 1980s.[19, 20, 21] The significant finding of the Kelley studies is that when the intruding infrasound is dynamically modulated short-duration pulses (generally under 100 msec and as short as 4 msec), the thresholds of sound pressure levels (SPLs) for non-auditory perception are in the range of 60 to 70 dB. In the work by one of the authors of this paper (James, with Mr. Wade Bray, INCE, of Head Acoustics, GMBH), infrasound pulsations were measured from a GE 1.5-MW wind turbine with a blade-pass frequency of 1 Hz that reached a level as high as 100 dB.[22] The people living in the home 'felt' the pulsations when the crests of the pressure waves were as low as 60 dB at 1 Hz. During similar measurements, Swinbanks, who has reported that he is sensitive to infrasound pulsations, was present at the test site. His experience was that he could feel the pulsations outside the home at similar SPLs.

Subsequent to the papers by Kelley and colleagues, several other studies have also reported the thresholds for significant experiences at similar thresholds, all substantially below the threshold for audibility of steady pure tones. In many of those tests, the rms SPL of the dynamically modulated blade-pass tone and its harmonics has been as low as 40 dB when using narrow-band analysis with windows of 40 to 80 sec, providing the crest of the pressure waves are 10 to 15 dB higher than the rms levels. These studies include the works of Robert Rand, INCE, and Stephen Ambrose, Bd. Cert., INCE, in their study of homes of complainants in Falmouth, Massachusetts;[23] Walker, Hessler, Hessler, and Schomer, in their work at the Shirley Wind project in Brown County, Wisconsin, for the Wisconsin Public Health Service;[24] and most recently, Steven Cooper's study of the Cape Bridgewater project in Victoria, Australia.[25] All of these studies report similar findings, namely that perception, generally non-auditory in character, begins when the rms SPLs of the modulating tones are as low as 40 dB rms, with increasing impacts as the rms levels rise to 50, 60, and to 70 dB and higher levels. In all these studies, the dynamic modulation of the blade-pass tones produce pressure peaks that are often 10 dB or more, sometimes much more, than the rms values.

In the opinion of the authors, a paper prepared by Swinbanks for the 2015 conference on wind energy in Glasgow, Scotland, shows the impact of dynamically modulated infrasound on a sensitive individual—himself—along with high-quality measurements of the environments in which he experienced the sensations.[26] That paper shows that a highly respected acoustician and

scientist with expertise in infra- and low-frequency sound also responds to this acoustic energy in a way that is similar to the many complaints from others, both in the location of his tests and at other wind energy projects around the world. In the paper, Swinbanks reports that he was able to differentiate the pulsations in the test data from at least six separate wind turbines in a project consisting of 46 1.5-MW GE models. He also reports that he was able to perceive the effects of the pulsations in his home's basement, approximately 3 km from the nearest operating wind turbine, with the SPLs of the blade-pass frequency and harmonics summing to about 55 dB rms. At closer locations, he measured positive-going pressure peaks of 87 dB with corresponding negative-going peaks of equal level. It is worth noting that at the Glasgow conference, Swinbanks presented the paper as a poster session,[27] as he was informed by the conference moderator that time restraints prevented him from presenting his paper to conference attendees.

In the 2012 investigation of infrasound at the Shirley Wind project, where local regulations require that the Nordex 2.5-MW turbines be sited at least 1,250 ft., or 381 m, from residences, Walker et al reported infrasound levels at one of the three test homes.[24] WTN was not audible outside the residence where infrasound was greatest, supporting the position that infrasound is at the root of at least some of the complaints. The blade-pass frequency and harmonics were clearly evident from the measurements inside that one home, and the family had moved far away for a solution.

Following the Shirley Wind team study, several members of the community conducted a series of micro barometer measurements inside homes ranging from 1,280 ft. to approximately 6 mi. from the wind turbine towers. Infrasonic tones at blade-pass frequencies and harmonics were found at all test sites, including test sites at distances of several miles or more from towers under downwind conditions. Testimony to Wisconsin's Brown County Board of Health by people with homes more than 4 mi. from the nearest wind turbines reported AHEs during the times the turbines operated. In mid-October 2014, the Brown County Board of Health went on record declaring that wind turbines at the Shirley Wind site "…are a human health hazard."[28] That action, which appears to be a precedent in the U.S., meant that Duke Energy's Shirley Wind utility were forced to prove to the Board that the utility was not the cause of the health complaints documented in the study and voiced by community residents. The outcome could result in a shut-down order, but no final decision had been made in that case at the time of this writing. Other examples of legally ordered turbine shutdowns include those in Massachusetts[29, 30] and Portugal.[31]

We will return to the issue of perceptibility of infrasound later in this paper, as we describe the physiological bases for perceptibility.

Statement 2: There is nothing unique about wind turbine noise, as infrasound and low-frequency noise are commonly produced by the body and by many environmental sources.

To begin, when the spectral characteristics of IWT noise, as depicted in several papers,[24, 32, 33] are compared to the spectra of subsonic jet transport planes,[34] five different types of aircraft,[35] and road traffic noise,[36] it is clear that noise generated by wind turbines has a number of unique acoustical characteristics. These comparisons reveal dissimilarities in spectral and peak levels in both the higher and lower frequency regions, including the low-frequency and infrasonic range.

Leventhall[37] was one of the first to describe how low-frequency noise is a special noise problem, particularly to sensitive people in their homes. He indicated that annoyance to low-frequency noise increases rapidly with level, often starting just above the threshold of audibility, and that about 2.5% of the population may be 12 dB more sensitive than the average person to low-frequency noise. He also noted that the World Health Organization (WHO) places a special emphasis on low-frequency noise as an environmental problem and source of sleep disturbance, even at low levels. The WHO[38] acknowledges that a noise consisting of a large proportion of low-frequency components may considerably increase AHEs and should be limited to below 40 dBA. Cummings[39] notes that sound levels of 40 dBA trigger high levels of community pushback.

Jung et al[40] experimentally identified the characteristics of acoustic emissions from large upwind wind turbines, with emphasis on ILFN. The sound spectral density showed that the blade-passage frequency component is clearly dominant, revealing up to 6-7 harmonics that generally occupy the infrasonic frequency region of 1 to 10 Hz. They voiced a concern that the low-frequency noise of the 1.5-MW and 600-kW wind turbines in the frequency range over 30 Hz would very likely lead to psychological complaints from ordinary adults.

In responding to a bylaw to restrict wind turbine infrasound in the town of Plympton-Wyoming, Ontario, Leventhall[41] declared that “Infrasound has become the Godzilla of acoustics” (p. 2). He concluded that science does not support the conditions in the bylaw, which was largely aimed at restricting blade-passing tones, because “There is no evidence that the very low level of blade passing tones affects humans, whilst there is evidence that it does not” (p. 7). Based on the kinds of evidence just discussed, we strongly disagree.

WTN has been described as having a character that makes it far more annoying and stressful than other sources of noise at the same A-weighted level, including traffic and industrial noise.[42, 43, 44, 45] Harrison[42] concluded that IWTs cause annoyance in about 20% of residents living within a distance considered acceptable by most regulatory authorities, and that for many of the 20%, the

annoyance and sleep disturbance lead to AHEs. Thorne[46] has pointed out that human perception of noise is based primarily on sound character rather than sound level, and that wind turbines are unique sound sources that exhibit special audible and inaudible modulated and tonal characteristics. He states that sound levels of 32 dBA Leq outside a residence and/or above an individual's threshold of hearing inside the home are markers for serious AHEs, especially among susceptible individuals.

Structural and human responses to low-frequency noise, including noise from wind turbines, have been described by Hubbard.[47] Hubbard and Shephard[48] illustrated the special characteristics of WTN by explaining its sources, pathways, and receptors. Thorne[46, 49] described wind turbines and *wind farms* as a unique source of sound and noise, like no other noise source or set of noise sources. The sounds are often of low amplitude and shifting in character, making it difficult for people who have never been exposed to such sounds to understand the problems of those who complain about the sounds. Shepherd et al[50] have described WTN as having characteristics sufficiently different from other, more extensively studied, noise sources to justify the application of standards different from pre-existing noise standards.

The preponderance of evidence on this point leads to the conclusion that WTN has special acoustic characteristics that distinguish it from other industrial sounds. A primary feature is that it consists of measureable energy down to below 1 Hz.[24, 51, 52] Its sound pressure level decreases rapidly with increasing frequency from about 0.5-5 Hz. It varies in amplitude over time,[9, 49, 51, 53, 54, 55, 56, 57, 58] it tends to have an intermittent tonal quality,[49, 52, 59] and its characteristics vary with distance and direction.[52, 53] It can result in an impulsive sound,[21, 40, 49, 60] even at long distances.[52] According to Lee et al,[53] the swishing sounds of turbines can be perceived from all directions, but at long distances from a turbine, low-frequency amplitude-modulated sounds can be heard only in particular directions and when the SPL is sufficiently high. This effect may make the WTN seem more impulsive at long distances despite an overall SPL that is relatively low.

Furthermore, ILFN from any source, including IWTs, is well known to penetrate walls and other barriers (e.g., Minnesota Department of Health[55]); is typically more disruptive indoors than outdoors;[46, 47, 61, 62, 63] and is not easily masked by atmospheric sounds, including road traffic and other sources of infrasound.[63, 64, 65, 66] The perception of low-frequency noise depends on density level, modulations, bandwidth, purity of blade-pass tones and harmonics, discrete beating tones, or other time-varying properties, and can occur even at near-infrasonic frequencies if any of these factors is present; otherwise, it might pass unnoticed.[57, 67, 68] James[69] describes the

infrasound occurring when wind turbine blades rotate past the tower as a short pressure pulse that consists of a well-defined array of tonal harmonics below 10 Hz. If the pressure peaks are received at the same time, they sum in a linear manner that significantly raises the overall SPL. Often, however, there are many wind turbines rotating at similar speeds, but not synchronized in time. This can lead to another form of modulation as the wind turbine infrasound is perceived as rising and falling, intermittent, or pulsating with variable intensity.

A common argument of wind industry proponents—one that is sometimes raised in legal proceedings—is that humans themselves generate infrasound by virtue of their own heartbeat and breathing, at levels that can be substantially higher than an external noise source such as wind turbines. In a rebuttal to a formal statement to this effect by the Association of Australian Acoustical Consultants (AAAC), Salt has provided a definitive explanation of why the two sources of infrasound (internal vs. external) cannot be equated. In a letter addressed to the AAAC,[70] Salt stated:

> "Stimulation of the ear occurs not directly by pressure (which is why deep sea divers can still hear) but by induced motions of the inner ear fluids, which in turn move sensory tissues and motion-sensitive cells….when low frequency and infrasound enters the ear via the stapes, it causes fluid movements throughout the entire ear between the stapes in the vestibule, through scala vestibuli and scala tympani to the compliant round window membrane at the base of scala tympani. It is these fluid movements that drive sensory tissue movements and cause stimulation. In contrast, pressure fluctuations generated by the body, such as by heartbeat and respiration, enter the ear via the cochlear aqueduct, not through the stapes. The cochlear aqueduct enters the ear adjacent to the round window membrane in the very basal part of scala tympani, so the fluid flows are localized in this tiny region of the ear. As the rest of the ear is bounded by a bony shell which is not compliant, fluid flows in the rest of the ear are substantially lower so that displacements of sensory tissues are negligible. Infrasound generated by the body, because it enters through the aqueduct, therefore does not cause stimulation of the ear."

Statement 3: There is no evidence that wind turbine noise, audible or inaudible, is the cause of adverse health effects in people, and there are no physiological mechanisms to explain how inaudible acoustic energy can be harmful.

In fact, there is ample evidence that noise in general, and especially low-frequency noise, has long-term consequences for human health.[71, 72] For example, long-term exposure to ordinary traffic noise has been associated in a dose-dependent manner with higher risk of myocardial infarction.[73]

Two landmark reports embodying diametrically opposing perspectives with regard to the impact of WTN on health appeared almost concurrently in 2009. One was published as a book by Dr.

Nina Pierpont,[4] a Fellow of the American Academy of Pediatrics who holds an MD degree from Johns Hopkins University School of Medicine and a PhD degree in Population Biology from Princeton University. The other report was written by a panel of seven experts (three physicians, two acousticians, an audiologist, and an audiologist/hearing scientist) commissioned by the American Wind Energy Association and the Canadian Wind Energy Association. The latter report[15] is commonly referred to as the AWEA/CanWEA report, or white paper. These respective reports, more than any others, quickly became the rallying cry for so-called anti-wind and pro-wind advocacy groups in the media, in the public discourse, and in court proceedings.

In her book, Pierpont[4] coined the term *Wind Turbine Syndrome* to describe a range of symptoms reported for 38 family members (adults and children) of 10 families who lived near wind turbines. Based on telephone interviews, she treated her observations and analyses as a case-series research design. She described the syndrome as consisting of 10 classes of symptoms (enumerated below), many of which she attributed to overstimulation of the vestibular system of the inner ear by ILFN. The wind industry, in its AWEA/CanWEA report and elsewhere, has vigorously criticized her study for being non-scientific and non-peer-reviewed. In fact, Pierpont's book was critically reviewed by far more than the usual number of reviewers for a peer-reviewed journal article. While it is true that case series are prone to selection bias, and can at best suggest hypotheses, many discoveries of new phenomena begin with a case study or case series. Furthermore, an increasing body of scientific evidence supports Pierpont's observations of a relationship between WTN and AHEs. More recent laboratory research, described later in this review, suggests that a variety of health symptoms may be due to ILFN stimulation of both vestibular and cochlear components of the inner ear.

Prior to Pierpont's book,[4] Dr. Amanda Harry[74] and Dr. Robyn Phipps and colleagues[75, 76] had documented the occurrence of ill effects from IWTs by use of questionnaire-based surveys of the health complaints of people living near wind projects in Cornwall, England, and Palmerston North, New Zealand, respectively. These authors concluded that a substantial number of people living near wind turbines suffer from health problems and that the cause of the disturbances was the complexity of the noise and vibration. Harry[74] observed that the symptoms were evident for people living within a mile from the wind development and recommended that no wind turbine should be sited closer than 1.5 mi. from the nearest residents. She noted that the guidelines used at the time to site wind turbines were developed when the turbines were 20% the size of the current ones. She concluded that annoyance from noise adversely affects human well-being, and that developers are wrong when they state that WTN is not a problem. Phipps et al[75] noted that 45% of households living within 2 km of the wind farm and 20% of households living up to 8

km away reported hearing noise from the turbines. Phipps[76] reported on the negative consequences of noise that were evident in her own survey and in the works of others, warning that residents do not readily habituate to the presence of WTN.

The AWEA/CanWEA report[15] has been widely used by the wind industry as a basis for its denial of AHEs from IWTs. However, the report is the product of a hand-picked group of experts, at least some of whom were known to hold positions favorable to the report's sponsors, it was never peer-reviewed, and it shows signs of bias, such as conclusions not supported by the research referenced in the report. That white paper concluded that sound from wind turbines, including sub-audible low-frequency sound, does not pose a risk of hearing loss or any other AHE in humans, whether those health effects are described as Wind Turbine Syndrome or otherwise. It also concluded that some people may be annoyed at the presence of sound from wind turbines, including its fluctuating nature, but described annoyance as unrelated to health. Although there is indeed no evidence that IWTs causes hearing loss, the report's conclusion that ILFN does not cause AHEs, and its dismissal of annoyance as a serious entity, have been heavily criticized as erroneous. Horner et al[77] cite many specific examples of the AWEA/CanWEA report's failure to use proper documentation, concluding that it lacks scientific merit and that it is neither authoritative nor convincing. They criticized the report's conclusion that the issue of AHEs stemming from IWTs is settled and that no more research is required, a conclusion that is rarely voiced by scientists. Horner[78] has characterized the report as offering nothing new in its treatment of annoyance, as annoyance has long been known to result from the stress effects of exposure to noise, and he criticized the report for downplaying the relationship between annoyance and health. Phillips[79] has indicated that the report mischaracterized the research designs used by epidemiologists. Despite widespread denial by wind industry advocates of a causal relationship between IWTs and AHEs, the vast majority of peer-reviewed papers have shown that IWTs significantly disturb sleep in at least some residents at distances and noise levels that are typical where IWTs are installed. Furthermore, not a single well-designed scientific study has found WTN to be harmless.[80, 81]

A panel of seven independent experts was commissioned by the Massachusetts Departments of Environmental Protection and Public Health to identify any documented or potential health impacts of risks that may be associated with exposure to IWTs and to facilitate a discussion of IWTs and public health based on scientific findings. The panel generated a report[82] concluding that scientific evidence is lacking to show that WTN leads to AHEs and that a more comprehensive assessment of WTN in populated areas is needed for establishing and refining siting guidelines and for developing best practices. Closer investigation was recommended near

homes where outdoor A- and C-weighted levels differ by more than 15 dB, a strategy for detecting the presence of ILFN (e.g., Kamperman & James[83]). The Massachusetts report has been criticized as misrepresenting the evidence it cites, as well as underestimating evidence indicative of AHEs from IWTs.[84, 85] Schomer and Pamidighantam[86] have described the report as a critique of the literature relating to wind turbine acoustic emissions and health effects, and one with problems similar to those it criticizes.

Some laypersons have remarked disparagingly in the media on the factual evidence—including observations and scientific reports—that shows a relationship between IWTs and AHEs. Shahan,[87] for example, confidently states: "To date, there is no scientific evidence that anything such as 'Wind Turbine Syndrome' actually exists." A common argument of wind energy advocates is that studies show that wind turbines do not lead to AHEs, or that studies that draw such a conclusion are not sufficiently scientific to establish causation. Efforts to discredit those who take a skeptical view toward the wind industry commonly use terms such as *opponents*, *detractors*, *anti-wind activists*, or in the case of Shahan,[87] "paid anti-wind 'experts' who have a long history of directly testifying against wind energy in various court cases." Such critics casually ignore the fact that many of the industry experts, including consulting acousticians and physicians, routinely testify on behalf of the industry in such cases, sometimes for substantial fees, and those individuals are rarely described as paid pro-wind experts or activists.

Numerous researchers have reported the existence of a constellation of health symptoms, either directly mirroring or closely related to those described as Wind Turbine Syndrome by Pierpont,[4] in persons living near IWTs. Significantly, the WHO[38] states that there is sufficient evidence that nighttime noise, irrespective of its source, is related to self-reported sleep disturbance and other health problems, and that these effects can lead to a considerable burden of disease in the population.

Sleep disturbance has been identified as a major adverse impact of IWTs.[4, 18, 45, 47, 54, 57, 58, 72, 74, 76, 77, 79, 80, 81, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107] Nighttime exposure to 40-dBA low-frequency noise has been shown to affect cortisol levels, a physiological indicator of stress. Those levels, following awakening, have been found to be associated with subjective reports of lower sleep quality and mood changes.[108] Sleep is a biological necessity, and disturbed sleep is associated with a number of adverse health conditions. The WHO[71] has concluded that there is available, good-quality evidence supporting a causal association between noise and sleep disruption. Sleep disturbance has important implications for public health and may be a particular problem in children.[84, 94, 109]

Even if no other adverse effects were associated with WTN, sleep disturbance alone is a sufficient reason to site turbines at distances that do not disrupt sleep. Many rural communities have background, nighttime sound levels that do not exceed 25 dBA, and observable effects of nighttime, outdoor noise do not occur at levels of 30 dBA or lower.[71] As outdoor sound levels increase, the risk of AH1Es increases, the most vulnerable populations being the first to show their effects. Vulnerable populations include elderly persons; children, especially those younger than age six; and people with pre-existing medical conditions, especially if sleep is affected.[38, 71] According to the WHO, there is ample evidence to link AHEs with prolonged exposure to outdoor sound levels of 40 dBA or higher. It is important to note that the WHO guidelines are based largely on industrial and transportation noise research, and not on wind turbine research. Because multiple studies (covered in this review) have indicated that WTN is significantly more annoying, has higher infra- and low-frequency sound energy, and is modulating, pulsatile, and sometimes tonal, it may impact health to a greater degree than other noises. This means that noise limits in the WHO guidelines may need to be adjusted downward when applied to WTN.

Additional factors increase the probability of sleep disruption due to WTN. The noise can be heard especially well in areas with low background noise levels, which usually occur at night. Also, lower nighttime wind speeds at ground level increase the nighttime contrast between WTN and background sound levels. Using test data taken during daytime wind conditions will result in a large underestimate of nighttime WTN levels, and thus underestimate the potential for sleep disruption.[38, 58]

Researchers who have studied the impacts of ILFN in general and WTN specifically on health, including some who have reviewed and assessed the findings of other researchers, have attributed a variety of symptoms to ILFN exposure. Those symptoms have been variously described by different researchers, with varying degrees of overlap and detail. They are shown, in no particular order, in Table 1.

Clearly, in addition to annoyance, the most commonly experienced and least-contested health symptom suffered by people living near IWTs is sleep disturbance.[110] Both the United Nations Committee against Torture (CAT) and the Physicians for Human Rights[111] describe sleep deprivation as critical to human functioning. According to Physicians for Human Rights:

> “Sleep deprivation ... causes significant cognitive impairments including deficits in memory, learning, logical reasoning, complex verbal processing, and decision-making; sleep appears to play an important role in processes such as memory and insight formation” (p. 22).

Table 1. Health symptoms described by different researchers as linked to exposure to infrasound and low-frequency noise, including exposure to industrial wind turbines.

Author (Year)	Reference	Symptomatology
Pierpont (2009)	4	Sleep disturbance; headache; Visceral Vibratory Vestibular Disturbance (VVVD); dizziness, vertigo, unsteadiness; tinnitus; ear pressure or pain; external auditory canal sensation; memory and concentration deficits; irritability and anger; and fatigue and loss of motivation
Leventhall (2003) Kasprzak (2014)	12 112	Vibration of bodily structures (chest vibration), annoyance (especially in homes), perceptions of unpleasantness (pressure on the eardrum, unpleasant perception within the chest area, and a general feeling of vibration), sleep disturbance (reduced wakefulness), stress, reduced performance on demanding verbal tasks, and negative biological effects that include quantitative measurements of EEG activity, blood pressure, respiration, hormone production, and heart rate
Havas & Colling (2011)	91	Difficulty sleeping, fatigue, depression, irritability, aggressiveness, cognitive dysfunction, chest pain/pressure, headaches, joint pain, skin irritations, nausea, dizziness, tinnitus, and stress
Horner (2013) Paller et al (2013)	78 113	Headaches, nausea, tinnitus, vertigo, and worsened sleep
Jeffery et al (2013)	92	Sleep disturbance; subjective complaints such as headaches, fatigue, temporary feelings of dizziness, and nausea; objective complaints such as vomiting, insomnia, and palpitations; annoyance; and reduced quality of life (QoL)
Jeffery et al (2014)	93	Negative impacts on the physical, mental and social well-being of people
Krogh et al (2012)	96	Annoyance (regarded as an adverse health effect associated with stress), sleep disturbance, headaches, difficulty concentrating, irritability, fatigue, and a variety of more-serious ailments
Minnesota Department of Health (2009)	55	Annoyance, reduced quality of life, sleeplessness, and headache
Howe Gastmeier Chapnik Limited (2010)	114	High levels of annoyance in a non-trivial percentage of persons, with annoyance associated with sound from wind turbines expected to contribute to stress-related health impacts in some persons

Author (Year)	Reference	Symptomatology
Nissenbaum (2013)	81	Sleep disturbances/sleep deprivation and the multiple illnesses that cascade from chronic sleep disturbance, which include cardiovascular diseases mediated by chronically increased levels of stress hormones, weight changes, and metabolic disturbances (including the continuum of impaired glucose tolerance through diabetes); psychological stresses that can result in cardiovascular disease, chronic depression, anger, and other psychiatric symptomatology; headaches, auditory and vestibular system disturbances; an increased requirement for and use of prescription medication; tinnitus; and vertigo
Nissenbaum et al (2012)	97	Increased sleep disruption, reduced mental health
Thorne (2013)	49	Sleep disturbance, headache, tinnitus, ear pressure, dizziness, vertigo, nausea, visual blurring, tachycardia, irritability, problems with concentration and memory, and panic attack episodes
Pawlaczyk-Luszczyńska et al (2005)	115	Problems with vision, concentration, and continuous and selective attention (especially in persons who are highly sensitive to low-frequency noise)
Pedersen (2011)	99	Annoyance (both outdoors and indoors), statistically related to SPLs; sleep interruption, diabetes, and tinnitus (at one of three test sites); annoyance outdoors, significantly related to sleep interruption, tension, stress, irritability (at all three sites), headache (at two sites), and undue fatigue (at one site); annoyance indoors, significantly related to sleep interruption (at all three sites), and to diabetes, headache, undue fatigue, tension, stress, and irritability (at one of three sites)
Roberts & Roberts (2013)	102	Vibration or fatigue, annoyance or unpleasantness
Shepherd & Billington (2011)	103	Annoyance, which has been linked to increased levels of psychological distress, stress, difficulty falling asleep, and sleep interruption
Taylor (2013)	58	Annoyance, stress, sleep disturbance, interference with daily living, headache, irritability, difficulty concentrating, fatigue, dizziness, anxiety, and reduced QoL
Ambrose et al (2012) Rand et al (2011)	61 116	Dizziness, irritability, headache, loss of appetite, fatigue, inability to concentrate, a need to leave the home, and a preference for being outdoors (during investigations of WTN by seasoned researchers, including acousticians)
Thorne (2011)	46	Sleep disturbance, anxiety, stress, and headaches

Author (Year)	Reference	Symptomatology
Palmer (2013)	117	Negative impacts on sleep, job stability, social relationships, care giving, pursuit of hobbies, leisure, learning, and overall health (based on interviews of residents four years after living near operational wind turbines)
Castelo Branco & Alves-Pereira (2004) Castelo Branco (1999)	118 119	Vibroacoustic disease, described as occurring only after extensive exposure to high levels of infrasound

Other sources quoted by the Physicians for Human Rights[111] note that:

> "A review of the medical literature reveals numerous adverse cognitive effects of sleep deprivation including impaired language skills-communication, lack of innovation, inflexibility of thought processes, inappropriate attention to peripheral concerns or distractions, over-reliance on previous strategies, unwillingness to try out novel strategies, unreliable memory for when events occurred, change in mood including loss of empathy for colleagues, and inability to deal with surprise and the unexpected" (pp. 22-23).

Another line of reasoning is that there is a cause-effect relationship between AHEs and ILFN from wind turbines that mirrors that in motion sickness. Kennedy et al[120] made acceleration recordings during 193 standard training mission scenarios for two moving-base flight trainers. The pilots, who were of comparable age and experience in both groups, were interviewed for motion sickness symptomatology and tested for ataxia after leaving the simulators. Motion sickness incidence was high for one of the simulators, but not for the second. Ataxia scores departed slightly from expected improvements following exposure in both simulators. Spectral analyses of the motion recordings showed significant amounts of energy in the *nauseogenic range* of 0.2 Hz. The authors concluded that simulator sickness in moving-base simulations may be, at least in part, a function of exposure to infrasonic frequencies that make people seasick. Later, von Gierke and Parker[121] advanced the notion that motion sickness may involve an intermodal sensory conflict between visceral graviceptor signals and vestibular stimulation. Schomer and colleagues[52, 86] have argued that similarities with motion sickness may explain some of the health symptoms suffered by individuals living near IWTs, given that the inner ear is capable of responding to accelerations of the kind that lead to seasickness. These accelerations correspond to frequencies in the infrasonic range, around and under 1 Hz. Schomer[66] states that

some persons affected by WTN may be responding directly to acoustic factors, rather than to non-acoustic factors, as argued by Leventhall.[14]

In a rare show of cooperation between the wind industry and independent acousticians, Pacific Hydro agreed to allow acoustician Steven Cooper, a consultant for The Acoustic Group,[25] unlimited access to its Cape Bridgewater wind project in SW Victoria, which had been in operation for about six years. The company allowed Cooper to make noise measurements and independently investigate the noise complaints of six affected residents at three residences located 650-1,600 m from the nearest turbines while the company controlled the on-off cycling of turbine operation. Given Cooper's credentials as an acoustician, the study was described as an acoustical study, as opposed to a medical study. Noise levels were based on A-, G-, and Z-weighted measurements, as well as 1/3-octave band and narrow-band measurements. Participants vacated their homes at night when necessary for Cooper to perform his acoustic studies, and they provided detailed diary accounts of their observations during on-off cycles. Those accounts included severity ratings of perceptions of noise impacts, vibration impacts, and other disturbances, which were collectively labelled as *sensations*. The sensations included headache; pressure in the head, ears, or chest; ringing in the ears; heart racing; or a sensation of heaviness. Synchronization of the timing of the residents' experiences with turbine operational data revealed heightened sensations inside their dwellings during turbine operation. Sensations were not dependent on the ability to hear or see the turbines, as residents were not aware of any of the turbines' operational characteristics. Cooper found that *sensation*, and not *noise disturbance*, was the major disturbance identified. Furthermore, sensations were most related to several different operating conditions of the turbines: at start-up, when there was an increase or decrease in power output of about 20%, and when the turbines were operating at maximum power and the wind speed increased above 12 m/sec.

Based on narrow-band data, Cooper identified a unique *wind turbine signature* (WTS) in which there was an energy peak at the blade-pass frequency and first five harmonics. Shutdown testing confirmed that the WTS, which included an amplitude-modulated signal, was present when the turbines were operating, but not in a natural environment during a turbine shutdown. Participants rated sensations as proportionally more severe as increases occurred in the magnitude of the low-frequency amplitude-modulated signature. The identification of infrasound components was consistent with earlier observations of Kelley et al.[19] Based on his findings, Cooper recommended that further studies be conducted to determine a threshold level of the WTS that protects against adverse impacts, and that the signature concept be used in medical studies by

identifying energy from the operation of wind turbines, as the A-weighted scale inside homes is of no assistance in such studies.

In consideration of the above findings and observations, it is reasonable to conclude that IWTs cause AHEs and other unwanted disturbances. We next examine the physiological mechanisms that may explain how inaudible infrasound can be harmful.

In a recent paper, Berger et el[122] concluded that ILFN levels are insufficient to induce AHEs, given the levels of ILFN typically produced by wind turbines, and that guidelines for audible noise are sufficient to protect human health. Their conclusions were based on measurements of indoor infrasound levels and low-frequency noise levels at distances >500 m that were similar to background levels. While we believe the design and major conclusions of their study to be faulty, their conclusions are consistent with the position taken by Leventhall and other wind energy advocates over the past decade.

In her original description of Wind Turbine Syndrome, Pierpont[4] described a distinctive constellation of symptoms that she believed to be due to stimulation, or overstimulation, of the vestibular organs of balance as a consequence of ILFN from wind turbines. She termed these symptoms Visceral Vibratory Vestibular Disturbance (VVVD). In a follow-up report, Pierpont[100] **s**uggested that the observed symptoms of Wind Turbine Syndrome are due to air-borne or body-borne low-frequency sounds that directly stimulate the inner ear, both the cochlea, or hearing organ, and the vestibular organs of balance and motion detection. As discussed below, research by Salt and associates shows that responses in the cochlea suppress the perception of low-frequency sound but still send signals to the brain, signals whose function is, at present, mostly unknown. The physiologic response of the cochlea to WTN is also a trigger for tinnitus and the brain-cell-level reorganization that tinnitus represents. Although cochlear and vestibular organs are housed within the same bony (otic) capsule, evolutionary adaptations have led to selective activation of auditory or vestibular hair cells. In the presence of certain disorders of the inner ear, however, anatomical defects in the otic capsule can alter the functional separation of auditory and vestibular stimuli, resulting in pathological activation of vestibular reflexes in response to sound.[123] The possibility that high-level ILFN can stimulate the vestibular organs lends credibility to Pierpont's suggestion and may explain the basis for symptoms that mimic other vestibular disorders. Physiologic responses from the otolith organs generate a wide range of brain responses, including dizziness and nausea, seasickness (even without bodily movement), fear and alerting responses such as startle and wakefulness, and difficulties with visually based problem-solving.[100] One candidate for the other destination of cochlear input from the outer hair cells may be the interface between the insula and the medial surface of the transverse (Heschl's)

gyrus, where primary hearing is experienced but not recognized as sound; the latter involves adjacent secondary areas.[124]

WTN can increase alerting responses that disturb sleep, even when people do not recall being awakened. This effect is one that clearly disturbs sleep and mental well-being out to 1,400 m (4,600 ft.) from turbines, with diminishing effects out to 3 km (3 mi.), as shown in a cross-sectional study by Nissenbaum et al.[97]

Laboratory studies conducted by Salt and colleagues have provided evidence that clearly establishes the biological plausibility that infrasound can adversely affect health. That work shows that there are mechanisms in the inner ear that are capable of transducing infrasonic energy into a neural signal that can be transmitted to the brain, where the signals can lead to such symptoms as tinnitus, dizziness, pulsations, and sleep disturbance. Those studies by Salt and associates have involved laboratory experiments funded primarily by the National Institutes of Health and conducted mostly on guinea pigs, whose ears are very similar to human ears. Basically, electrodes were inserted into the inner ears to determine which structures respond to specific types of electroacoustic stimulation. Their findings help to explain why sound that is normally inaudible can result in the kinds of negative reactions reported by people who are exposed to wind turbine ILFN. Findings from their research indicate the following:

(1) The inner hair cells (IHCs) of the inner ear, which are primarily responsible for transmitting signals to the brain that are interpreted as sound, are velocity-sensitive, and thus unresponsive to infrasound. The outer hair cells (OHCs), on the other hand, are displacement-sensitive and respond to infrasonic frequencies at levels well below those that are heard (i.e., interpreted as sound). This suggests that most IWTs produce an unheard stimulation of OHCs;[56, 125, 126] specifically, at 5 Hz the OHCs can be stimulated at sound pressures 40 dB below those that stimulate the inner hair cells associated with conscious hearing.[126]

(2) Low frequencies, which are coded in the cochlear apex, require less low-frequency SPL to be amplitude modulated, when compared to higher frequencies, which are coded in the cochlear base. This means that amplitude modulation of audible sounds by wind turbine infrasound may be the basis for complaints of those living near wind turbines, including complaints such as annoyance or feelings of throbbing and rumbling sensations. It also means that infrasound from wind turbines need not be audible to annoy people, since infrasound can amplitude modulate sounds that are within the range of audibility.[54]

(3) There are several ways that infrasound could affect people, even though they cannot hear it: (a) causing amplitude modulation (pulsation) of heard sounds, (b) stimulating subconscious pathways, (c) causing endolymphatic hydrops, and (d) possibly potentiating, or exacerbating, noise-induced hearing loss.[127]

(4) Responses to infrasound reach the brain through pathways that do not involve conscious hearing but instead may produce sensations of fullness, pressure or tinnitus, or absence of sensation. Activation of subconscious pathways by infrasound could disturb sleep.[128]

(5) The presence of other, higher-pitched sounds (between 150-1,500 Hz) can suppress infrasound.[129, 130, 131] Because the ear is maximally sensitive to infrasound when higher frequency sounds are absent, this means that WTN is most disturbing to persons inside their homes at night, when background sound levels are low and higher-pitched sounds are attenuated by walls and other physical structures.

(6) A pathway exists, through the OHCs, for infrasound to reach the brain. There, parts of the brain other than auditory centers become active and the signals are perceived as something other than sound. This pathway to the brain, which also includes the vestibular mechanism of the inner ear, means that it is biologically plausible for infrasound to produce a variety of sensations, including pulsation, annoyance, stress, panic, ear pressure or fullness, unsteadiness, vertigo, nausea, tinnitus, general discomfort, memory loss, and disturbed sleep (with chronic sleep deprivation leading to blood pressure elevation and possibly changes in heart rate).

On the above grounds, Salt dismisses the common perception that *What we can't hear can't hurt us*, and has stated unequivocally that "Wind turbines can be hazardous to human health."[132]

Interestingly, Oohashi et al,[133]using non-invasive physiological measurements of brain responses, found evidence that sounds containing *high-frequency* components *above* the audible range, or ultrasound, significantly affect the brain activity of healthy human listeners. It should not be considered implausible, therefore, that infrasonic stimulation can also activate the brain.

Recent research supports the plausibility of such effects. Bauer et al,[134] using functional magnetic resonance imaging (fMRI), found a significant response down to the 8 Hz, the lowest frequency presented, to be localized within the auditory cortex. Using magnetoencephalography (MEG), significant brain responses could be detected down to a frequency of 20 Hz. The authors hypothesized that a somatosensory excitation of the auditory cortex possibly contributes at these frequencies. In a somewhat related study, He and Krahé[135] demonstrated a significant relationship between EEG reactions under different low-frequency noise exposures and

subjective annoyance. Noise sensitivity was also found to be an important factor in most of the observations. The authors of these two studies suggested that EEG, fMRI, and MEG may serve as effective physiological measures to explain negative reactions to low-frequency noise.

Kugler et al[136] measured spontaneous otoacoustic emissions (SOAEs) before and after stimulation with perceptually unobtrusive low-frequency sound (30 Hz) and found significant changes to occur; these changes were positively correlated in frequency and level to pre-exposure status and lasted for about 2 min after stimulation. SOAEs are narrow-band acoustic signals that are spontaneously emitted by the inner ear in the absence of acoustic stimulation, and they can be recorded simply and non-invasively in the ear canal with a sensitive microphone. Otoacoustic emissions, first reported by physicist David Kemp,[137] are a by-product of active biophysical amplification by OHCs in the cochlea, persisting in relatively stable form for years under normal physiological conditions. The main task of the OHCs is to detect and mechanically amplify sound waves. In acting as a cochlear amplifier, OHCs actively generate mechanical energy, which is fed back into the cochlear travelling wave to maximize the sensitivity and dynamic range of the mammalian ear. In humans, non-invasive recordings of different classes of sound-evoked otoacoustic emissions (EOAEs) allow indirect access to OHC function, but only SOAE measurements can probe the cochlea in its natural state. The presence of OAEs signals a healthy ear, and their absence or changes in their response patterns can signal pathological function. The significance of the work by Kugler et al is that it reveals OHC function to be affected by a brief exposure to very low-frequency sound that is largely imperceptible. It also reveals that measures of perception severely underestimate OHC sensitivity. The authors concluded that direct quantifications of inner ear active amplification, as measured in their study, are well suited for assessing the risk potential of low-frequency sounds. In the present context, the study provides further support for the notion that what we can't hear can potentially affect us.

Motion sickness has been mentioned in this article as being among the variety of symptoms suffered by individuals living near IWTs. Recalling the work of Kennedy et al,[120] who found evidence of motion sickness in Navy pilots subjected to acceleration during flight simulation, Schomer et al[138] stated that it is plausible that the ear responds similarly to accelerations of a moving vehicle and acoustic pressures at infrasonic frequencies under 1 Hz, in the nauseogenic range. They suggested that the AHEs experienced as a consequence of exposure to IWTs not only bear a striking resemblance to motion sickness, but that the condition may be induced by stimulation of the otolithic organs in the vestibular system of the inner ear. That type of stimulation is purportedly worse when a person is subjected to pressure changes in a closed

cavity, including inside one's home. Further, they describe the type of research needed to verify their hypothesis.

Michaud and colleagues have recently authored a series of papers[139, 140, 141, 142, 143, 144, 145] describing a cross-sectional epidemiological study conducted under the sponsorship of Health Canada, in which they investigated the prevalence of health effects or health indicators among a sample of Canadians exposed to WTN. The studies employed both self-reported and objectively measured health outcomes. The final sample, drawn from communities in Ontario and Prince Edward Island where a sufficient number of dwellings were located near wind turbine installations, included 1,238 participates (606 males, 632 females) living between 0.25 and 11.2 km from operational turbines. One participant between the ages of 18-79 years was randomly selected from each household. The reported response rate was 78.9% and did not significantly vary across sampling strata or provinces. Modelled A- and C-weighted WTN levels reached 46 dBA and 63 dBC, respectively, and the two levels were found to be highly correlated, which suggested that C-weighted values offered no additional information beyond that offered by A-weighted values. Only minor differences across strata were reported for age, employment, and type and ownership of dwelling. WTN exposure was not found to be related to hair cortisol concentrations, blood pressure, resting heart rate, or any of several measured sleep parameters (i.e., sleep latency, sleep time, rate of awakenings, sleep efficiency). Self-reported results obtained through an in-person questionnaire did not provide support for an association between increasing WTN levels and self-reported sleep disturbance, use of sleep medication, or diagnosed sleep disorders. Similarly, no significant association was found between WTN levels and self-reported migraines, tinnitus, dizziness, diabetes, hypertension, perceived stress or any measure of QoL. However, they observed statistically significant exposure-response relationships between increasing WTN levels and the prevalence of long-term high levels of annoyance toward noise, shadow-flicker, visual impacts, blinking lights, and vibrations.

The authors of the present report, along with a number of professional colleagues with acoustical or medical expertise, have carefully analyzed the reports by Michaud and colleagues and have concluded that the research protocol of the Health Canada study reflects shortcomings that severely undercut the conclusions that were drawn in the various reports. To enumerate the major flaws in the Michaud et al reports:

(1) They incorrectly concluded that AHEs were not found when sound levels were below 46 dBA by failing to benchmark their "surrogate control group" against the general population. Proper analysis, using a proper control group, would have resulted in high correlations of these symptoms with decreasing distances to, and increasing noise levels from, wind

turbines. In reports of the sound-exposure data, sound levels of 30-35 dBA were significantly associated with increases in the prevalence rates of symptoms. This indicates that the 40 dBA currently used as the permissible threshold in Ontario and other Canadian provinces is not protective of the public's health and welfare.

(2) Key health symptoms were reported primarily for non-vulnerable populations, in that younger individuals and individuals who had left their homes were excluded from participation. Those exclusions invalidate the study as a reflection of health conditions in the general population.

(3) Evidence provided by the World Health Organization[38] showing that exposure to noise from vehicles, railways, and aircraft is linked to serious physiological and psychological health effects at sound levels of 40 dBA and higher, and that lower levels are needed to protect the more vulnerable members of the population, was ignored in the Health Canada study. The finding that AHEs did not occur below 46 dBA should have been a warning sign to the researchers that their study design, their analyses, or both, were flawed.

Statement 4: Setback distances of 1,000-1,500 ft. (approximately 0.3-0.5 km) are sufficiently safe to protect humans from harm, regardless of height or other physical characteristics of the IWTs.

Many zoning ordinances that regulate IWTs specify the height of the turbine tower from its base to blade tip, plus 10% to 100%, as a setback distance that sufficiently protects residents against a catastrophic event such as a tower failure, a falling blade, or ice throw. Some ordinances specify a distance of twice the base-to-blade tip height, roughly 900 ft., while others arbitrarily specify slightly longer distances such as 1,500 ft. or 0.5 km. Most of the reported health symptoms have been observed at distances much greater than these setback distances. One can deduce, therefore, that *setbacks intended to protect physical health from mechanical or other traumatic failure of a wind turbine component are not adequate to protect general health and well-being*.

While terrain, weather patterns, number and size of turbines, and the turbine array itself can influence the ILFN emitted from IWTs, the two major factors are turbine size and distance from the receiver. Distance is the only practical means of achieving acceptable sound levels, as controlling the noise through the erection of barriers or enclosures near the source or receiver are not feasible or effective. Because infrasound is involved, closing windows, insulating buildings (including residences), and sleeping in basements are not normally helpful in attenuating the noise, and there is less likelihood that the emissions will be masked by wind at ground level.[60, 146] Noise levels must be measured by qualified personnel, and the sound level at the residence—or arguably at the property line—is the key element in protecting the health of residents.

To protect human health, a number of researchers have recommended specific distances, while others have recommended limitations on sound levels, irrespective of the distances needed to achieve those levels. Such recommendations are based on observed or reported complaints of AHEs. Though quite specific, the recommendations vary somewhat widely, as shown in Table 2.

The recommendations in Table 2 include boundaries of distance and noise levels of 0.5-2.5 mi. and 30-40 dB, respectively, that are believed by various professionals to protect human health. Although the use of maximum permissible noise levels appears to be the optimal approach for protecting the greatest number of people, the existence of multiple acoustic and environmental factors complicates our ability to recommend a single distance or noise level that protects most residents. Those factors are covered elsewhere in this review.

Table 2. Recommended minimum siting distances and maximum noise levels of industrial wind turbines, based on the protection of human health.

Author (Year)	Reference	Distance/Level
Pierpont (2009) Kamperman & James (2008)	4 83	Distance of 1.25 mi, or 2 km
Nissenbaum et al (2012)	97	Minimum distance of 0.87 mi, or 1.4 km, based on experimental conditions studied
Harry (2007)	74	Minimum distance of 1.5 km from nearest turbine
Frey & Hadden (2007)	90	2 km between family dwellings and IWTs of up to 2-MW installed capacity, with greater separation for a wind turbine greater than 2-MW installed capacity
Shepherd & Billington (2011)	103	4 km, to protect against amplitude-modulated turbine noise
Position of the National Institute of Public Health-National Institute of Hygiene on wind farms (2016)	147	A minimum distance of 2 km of wind farms from buildings
Cummings (2011)	39	Distance of ½ mi or greater; noise levels within 5-10 dB of existing background conditions; sound levels below 40 dBA, or even 30-35 dBA, as levels of 40 dBA or higher trigger large numbers of noise complaints
World Health Organization (2009)	38	Outdoor sound levels <40 dBA, with vulnerable populations expected to be most affected

Author (Year)	Reference	Distance/Level
Knopper et al (2014)	148	Sound levels <40 dBA, for non-participating receptors
Horner (2013)	78	Sound levels <30 dB
Harrison (2011)	42	Sound levels limited to 35 dBA at nighttime and 40 dBA during daytime hours; 5-dBA and 4-dBA penalties, respectively, imposed for the periodic or impulsive character of turbine noise and for uncertainty in noise prediction
Thorne (2013)	49	Sound levels <32 dB LAeq outside a residence

Statement 5: Annoyance is a nuisance, but it is not a health issue.

In the past few years, the position of the wind industry has changed from a blanket denial of any impact from noise to admitting that IWT noise is annoying to a substantial portion of exposed populations, and that annoyance from ILFN is a well-accepted phenomenon. While Bolin et al[18] and Ellenbogen et al[82] downplay the relationship between annoyance and WTN, the larger research community has documented that ILFN from wind turbines and other sources leads to annoyance.[12, 14, 15, 19, 21, 37, 38, 40, 42, 46, 49, 55, 58, 59, 63, 64, 74, 78, 80, 81, 90, 92, 94, 98, 99, 102, 118, 146, 149, 150]

Several investigators have concluded that annoyance increases in a dose-response relationship as distance from turbines is reduced.[44, 89, 146] A number of studies have concluded that noise annoyance appears to be worse when nearby residents have negative attitudes and when visual annoyance or intrusive sound characteristics are also involved.[e.g., 44, 65, 112, 146, 151] However, the annoyance from visual stimulation and the annoyance from noise may be entirely independent. The two irritants do not have to be linked. The common factor is that as one moves closer to a wind turbine, it is perceived as both larger *and* louder. One recent study,[152] which compared visual, audible noise, and combined visual-auditory representations of wind turbines, found noise sensitivity to correlate with both noise and visual annoyance. That study also demonstrated a reciprocal influence between auditory and visual stimuli, but in essentially a direction opposite that predicted by earlier studies of wind turbine visibility and noise. Interestingly, the study showed that a visual stimulus had a mitigating effect on noise annoyance, while an auditory stimulus had a disturbing effect on visual annoyance. This finding supports the idea that humans perceive the environment holistically and in context of all perceptual information. In suggesting that auditory and visual features are processed in close interaction, it forces us to question the idea that annoyance from WTN arises largely because the turbines are visible. Given our current

state of knowledge, it seems reasonable to accept that people can be annoyed by auditory and visual irritants independently, even though there may be interactions between them.

Annoyance occurs in residents living near wind turbines at lower sound levels than for transportation noise, industrial noise, or other sources.[38, 42, 43, 58, 64, 93] Perception and annoyance have been found to be associated with both urbanized and rural terrains.[149] Pedersen et al,[146] in summarizing survey data on annoyance from wind turbines in the Netherlands and Sweden, found that 25% or more of all respondents were annoyed by levels of 40-45 dBA, while about 18-20% were very annoyed by those levels. A total of 18% found outdoor levels of 35-40 dBA to be rather annoying or very annoying outdoors and 8% found those levels to be rather or very annoying indoors. For outdoor levels of 40-45 dBA, 18% and 16% were rather or very annoyed outdoors and indoors, respectively. Because such surveys tend to emphasize *noise* from wind turbines, results often reflect levels of annoyance that relate more directly to audible sounds, as opposed to infrasound.

While few would argue that noise from wind turbines annoys a substantial percentage of nearby residents, there is disagreement over whether it leads to AHEs. Colby et al[15] stated that:

> "…there is no evidence for direct physiological effects from either infrasound or low frequency sound at the levels generated from wind turbines, indoors or outside" (p. 3-8).

They reasoned, therefore, that annoyance is not a pathological entity. Their basic contention was that although wind turbines produce infrasound, it is not harmful because people can't hear it. They contended that while some people may be annoyed by the sound from wind turbines — presumably audible sound—annoyance is primarily due to the fluctuating nature of the noise and personal attitudes. In their view, it is a psychological reaction, as opposed to a direct physiological reaction to sound. As noted above, however, several investigations[44, 89, 146] have found a dose-response relationship to exist between measured or estimated sound levels and annoyance. IWT noise emissions have been found to be a mediator between exposure and sleep disturbance and psychological distress,[89] and to be directly associated with stress.[e.g., 104]

The documented health symptoms from exposure to wind turbines are often stress-related and exacerbated by sleep disorders; they appear to be mediated through both direct and indirect pathways, and the result can be serious harm to human health.[92] There is an association between WTN, stress, and well-being, and this association is a potential hindrance to psycho-physiological restitution.[58, 98] The WHO has described annoyance as a critical health effect, in that in some people it is associated with stress, sleep disturbance, and interference with daily living.[38] A range of symptoms, often described as stress responses, have been associated with

WTN in people living in the vicinity of wind projects. As Pierpont[4] and others have noted, these symptoms include headache, irritability, difficulty concentrating, fatigue, dizziness, anxiety, and sleep disturbance. Regardless of whether the perceived impacts of noise from wind projects are physiological or psychological in nature, they are considered to cause AHEs through sleep disturbance, reducing the quality of life and serving as a source of annoyance that sometimes leads to stress-related symptoms.[71] The potential of environmental noises to induce stress reactions is well known. These reactions are dependent on how the noises are interpreted in the central nervous system; medical effects such as increased blood pressure, for example, are known to result from prolonged noise exposure.[153]

Generally, models that explain the relationship between noise and health fall into two broad categories, based on pathways that are *direct* or *indirect*. Figure 1, which is a modification of a figure from Shepherd et al,[50] depicts three models, one direct and two indirect, that have been described in the contemporary literature. The first (Fig. 1a) represents a direct pathological relationship between an environmental parameter (e.g., noise level) and a target organ that affects health. For example, in this model, noise can affect both cognition and sleep, and thus directly impact health. An alternative approach (Fig. 1b) distinguishes between direct health effects and psychosomatic illness. This approach suggests that any physiological illness coinciding with the onset of WTN may be caused by a negative psychological response to the noise, and not the noise *per se*. Any anxiety or anger resulting from the presence of WTN induces stress and strain that, if maintained, can eventually lead to AHEs. Another explanation that involves an indirect pathway from sound to health effects is one that is consistent with the WHO's definition of health.[38] That model (Fig. 1c) recognizes the role of environmental moderators, or mediators, in the determination of whether a sound is (unwanted) noise, and, if so, whether or not the noise

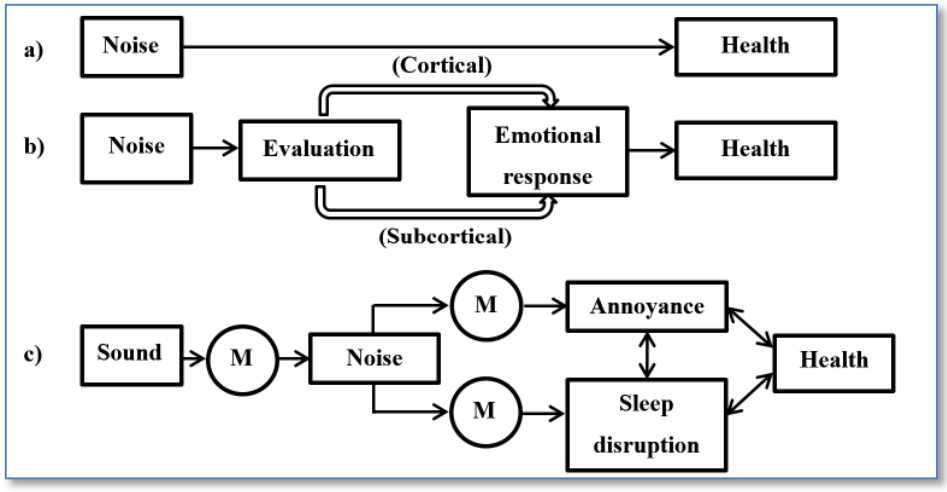


Figure 1. Three models representing the relationship between noise and health: the biomedical model (a) stipulating a direct causal relationship and indirect models (b and c) containing moderators and mediators (Adapted from original source and used with permission of first author, Daniel Shepherd).[50]

negatively impacts health. Mediators include factors such as degree of urbanization, house type, and sound level, and psychological and demographic moderators such as age, gender, education, employment status, attitudes to wind energy, noise sensitivity, and whether the individual receives a monetary return from the turbines. In this model, sleep disruption plays a major role in producing AHEs, with annoyance and sleep disruption being intervening factors between noise and AHEs for some people.

Authors of a recent study,[154] which focused on the province of Ontario, acknowledge both the link between annoyance and health and the possibility that wind projects can exacerbate psychosocial health problems through social processes such as intra-community conflict. They list socially mediated health concerns, distribution of financial benefits, lack of meaningful engagement, and failure to treat landscape concerns seriously, as the core stumbling blocks to a community's acceptance of wind energy development.

Statement 6: Noise cannot account for all of the complaints of people living in the vicinity of wind turbines; there must be another, unknown reason for the complaints.

Havas & Colling[91] have observed that wind turbines generate electromagnetic waves in the form of poor power quality (*dirty electricity*) and ground current, and speculate that these waves can adversely affect those who are electrically hypersensitive. McCallum et al[155] performed magnetic field (EMF) measurements in the proximity of 15 Vestas 1.8-MW wind turbines, two substations, various buried and overhead collector and transmission lines, and nearby homes in the vicinity of Goderich, Ontario, during high-wind, low-wind, and shut-off operational stages. They concluded that there is nothing unique to wind farms with respect to EMF emissions, finding that magnetic field levels in the vicinity of wind turbines were lower than those produced by many common household electrical devices and that levels were well within any existing regulatory guidelines with respect to human health.

Although at least a few of the health symptoms mentioned above have been self-reported by individuals who are exposed to electromagnetism, clinical trials to date suggest the link between health complaints and exposure to electromagnetism to be a purely psychological one, or a nocebo effect, in that self-described sufferers of electromagnetic hypersensitivity are unable to distinguish between exposure and non-exposure to electromagnetic fields.[156] Another review paper[157] found no convincing scientific evidence that symptoms are caused by electromagnetic fields. However, one cannot rule out that the design of the experiments upon which the review papers drew their conclusion may have missed some unique characteristic that could account for the anecdotal evidence. (See our earlier statements describing how failure to identify infrasound

pulsations as a causal factor for perception at pressure levels below those needed for audibility have led some to conclude that IWT infrasound causes no harm.) When faced with health complaints from families who live near IWTs, especially when there are repeated instances of symptoms that wax and wane with alternating sequences of exposure and non-exposure, and especially when those families have taken the drastic step of abandoning their homes, it is unreasonable to argue that noise is not the cause of the complaints. Even if other factors such as electromagnetic waves are the root cause of a given complaint, it is still the placement of turbines too close to those residents that is the most likely cause of the problem.

Unfortunately, not as much is known about the effects of electromagnetism as is known about ILFN. At this point in time, therefore, it is reasonable to conclude that more people who live near wind turbines are negatively affected by ILFN than by hypersensitivity to dirty electricity or ground current, as measurable levels of ILFN from wind turbines are highly associated with individual complaints. When Stigwood et al[57] studied and analyzed complaints at over 75 wind developments in the U.K., they found that identifying the problems was straightforward, occurrence was common (i.e., some residents reported problems in all developments), all developments generated excess amplitude modulation (AM), and AM was the cause of the vast majority of the complaints. These findings have recently been reinforced by Cooper's work[25] in Australia.

Statement 7: Infrasound from wind turbines is sufficiently correlated to the A-weighted sound emissions to allow an A-weighted model to be used to predict how much infrasound is present in homes.

This statement is not typically stated explicitly, but it is one that is inherent in the positions commonly taken by wind energy advocates and regulatory bodies through their interpretations and acceptance of research on WTN, which is based largely on A-weighted levels. As noted in many previous papers, including one of our own,[101] the continued use of the A-weighting scale in sound level meters is a major basis for misunderstandings that have led to acrimony between advocates and opponents of locating wind turbines in residential areas. The dBA scale was devised as a means to incorporate into measurements of environmental and industrial SPLs the inverse of the minimum audibility curve[158] at the 40-phon level. It is typically used, though, to specify the levels of noises that are more intense, where the audibility curve becomes considerably flattened, obviating somewhat the need for A-weighting. Use of the A-weighted scale is mandated or recommended in various national and international standards for measurements that are compared to damage-risk criteria for hearing loss and other health effects resulting from occupational or environmental noise exposure. It drastically reduces sound-level

readings in the lower frequencies, beginning at 1,000 Hz, and reduces sounds at 20 Hz by 50 dB. For WTN, the A-weighting scale is especially inappropriate because of its devaluation of the effects of ILFN. Many authors have commented on its inadequacy. For example, Pederson and Persson Waye[159] state:

> "There is… support both from experimental and field studies that intrusive sound characteristics not fully described by the equivalent A-weighted sound pressure level contribute to annoyance with wind turbine noise" (p. 4).

A number of researchers have recommended comparing C-weighted measurements to A-weighted measurements when considering the impact of sound from wind turbines.[10, 12, 37, 61, 67, 75, 76, 83, 101] According to these sources, the presence of infra- and low-frequency sound is generally indicated when the difference between levels on the two scales differs by 10-20 dB. When such differences are observed, the use of third-octave or linear-scale measurements is typically recommended (for example, see Shepherd et al[50]). Other weighting scales have been suggested for wind turbine applications, but at present, linear-scale or narrow-band measurements, used in conjunction with a conventional sound level meter (with low-frequency microphone) and micro barometer, offer the best potential for accurately and completely describing the soundscape in the vicinity of IWTs.

As noted above, Cooper[25] has suggested that A-weighted levels, measured inside homes, are not likely to be useful indicators of AHEs. That report concluded that A-weighted levels are not a valid index of protection from AHEs and recommended the further exploration of a newly developed *wind turbine signature* scale, based on the discovery of its capability to quantify the amplitude-modulated peak energy in the infrasonic frequency region. That scale was shown to be directly linked to a variety of adverse bodily sensations when nearby turbines were operating or undergoing transitions in operation.

Although A-weighted sound level measurements have been the *sine qua non* for specifying environmental and occupational noise levels for many decades, we must recognize the inherent inadequacies of applying the A-weighting scale to quantifying noise emitted by IWTs. Bray[160] goes even further by noting that people, and not electronic devices, are the ultimate analysts of data that affect their responses to sound, making the point that people's responses should be given the credence they deserve, and not be devalued when physical measurements fail to confirm them.

Statement 8: Wind Turbine Syndrome has not been accepted as a diagnostic entity by the medical profession, so medical professionals cannot diagnose or treat it.

Currently, Wind Turbine Syndrome is not included in the International Classification of Diseases (ICD) coding system, which is used globally for purposes of establishing categories for diagnosing diseases and other health conditions, and as a basis for reimbursing medical providers for diagnostic and treatment services. Yet, of the 10 symptom sets comprising Pierpont's Wind Turbine Syndrome,[4] at least seven are included as a category or subcategory in the newly revised (ICD-10) coding system. The fact that the syndrome itself is not included may be due to its relatively recent discovery, but is more likely due to the fact that the syndrome consists of symptoms that are highly variable from person to person and affect a minority of the exposed population.

Especially in legal proceedings, it is important to distinguish between the terms *differential diagnosis* and *causation assessment*. It is the latter that is most often the subject of such proceedings. Attorneys and expert witnesses often get the terms confused. Differential diagnosis refers to the identification of disorder(s) that may account for a particular complaint or symptom complex. It rarely deals with the external cause of the disorder. Causation assessment, on the other hand, typically requires an evaluation of whether potential causative agents have irritating properties; a determination of the approximate amount of exposure, or dose, of that agent, and the timing between exposure (and non-exposure) and the occurrence of symptoms; and an assessment of whether alternative potential causes of the disorder can be ruled out. These latter steps are not necessarily considered part of the diagnosis.

Notwithstanding the fact that Pierpont herself is a practicing pediatrician, a couple of recent developments would appear to increase the prospect that medical personnel will soon be able to establish Wind Turbine Syndrome, by that or a similar label, as a clinical entity caused by exposure to WTN. Dr. Robert McMurtry, a physician who is a special advisor to the Canadian Royal Commission on the Future of Health Care, and a long-time advocate for more effective public involvement in healthcare policy, recently published a set of highly specific criteria for establishing such a link. McMurtry[161] originally proposed a case definition that identifies first-, second-, and third-order criteria, as well as specified circumstances and symptoms that must be established before AHEs can be attributed to wind turbine exposure. According to those criteria, probable AHEs are present when:

(1) All four of the following first-order criteria are met: (a) The individual resides within 5 km of IWTs, (b) Health status is altered following the start-up of or initial exposure to, and during

the operation of, IWTs (a latent period of up to 6 months may be allowed), (c) Amelioration of symptoms occurs when more than 5 km from the environs of IWTs, and (d) Recurrence of symptoms occurs upon return to the environs of IWTs within 5 km.

(2) At least three of the following second-order criteria are met (occurring or worsening after the initiation of operation of IWTs): (a) Compromised quality of life, (b) Continuing sleep disruption, difficulty initiating sleep, and/or difficulty with sleep disruption, (c) Annoyance producing increased levels of stress and/or psychological distress, and (d) A preference to leave the residence temporarily or permanently for sleep restoration or well-being.

(3) At least three specified symptoms occur or worsen following the initiation of IWTs, those symptoms referred to as third-order criteria that fall within the following categories: (a) Otological and vestibular disorders, (b) Cognitive disorders, (c) Cardiovascular disorders, (d) Psychological disorders, (e) Regulatory disorders, or (f) Systemic disorders.

To be confirmed as AHEs from WTN exposure, McMurtry indicated that consideration should be given to other stressors present in the community, that sleep studies be carried out if at all possible, and that a licensed physician be able to rule out alternate explanations for AHEs. These alternate explanations include substantial barometric changes from prevailing winds, a stressful home environment, and psychological and/or mood disorders, all of which can normally be ruled out when symptoms subside or disappear when the individual leaves the vicinity of the wind turbines. Apart from these three factors, he indicates that there are very few, if any, other health conditions that can mimic those caused by exposure to wind turbines and at the same time meet the three orders of criteria outlined in his case definition. More recently, McMurtry and Krogh[162] published a revised case definition, in which the third-order criteria—which are commonly present—are not considered essential elements. In both papers, the authors acknowledged that the identification of IWTs as the cause of adverse health symptoms is a complex emerging issue that requires further study to validate the criteria. They proposed key elements that ought to be included in any model used to assess the validity of the case-definition criteria.

McCunney and colleagues[163] have challenged those case definitions as having poor specificity, leading to a substantial potential for false-positive assessments and missed diagnoses. A potential fallacy in this challenge is that the authors unnecessarily conflate the concept of case definition for medical practitioners with that of an epidemiologic research plan. The case definitions presented by McMurtry[161] and McMurtry and Krogh[162] represent guidelines for medical doctors whose individual patients are experiencing new or unusual symptoms. It is erroneous to purport that a physician’s mental process can be encapsulated into a set of equations, especially

during the earliest stages of developing a case definition. The criticisms of these early case definitions should not deter physicians from attempting to evaluate and treat patients who report AHEs after living in the vicinity of IWTs. This area may indeed benefit from further study. Our view, however, is that such criteria provide an adequate starting point for guiding medical practitioners.

Dr. Steven Rauch, an otolaryngologist at the Massachusetts Eye and Ear Infirmary and a professor at Harvard Medical School, recently declared that he believes Wind Turbine Syndrome to be a real phenomenon.[164] As reported by numerous websites and newspapers, multiple patients have sought treatment from him for AHEs stemming from consistent exposure to IWTs. Rauch compares the syndrome to migraine headaches and believes that people who suffer from migraines are among the most sensitive to the effects of WTN, and he has stated that the wind industry aims to suppress the notion of Wind Turbine Syndrome by blaming the victim.

Given these developments, it is possible that the medical profession may someday embrace Wind Turbine Syndrome—by that or another name—as a clinical entity. This prospect is encouraging, as such acceptance by the profession will facilitate efforts to protect individuals from the harmful health effects of exposure to IWTs. Even though it may be some time before such a diagnostic label is formally acknowledged as an ICD code, it is currently possible for physicians to identify many of the specific symptoms associated with wind turbine exposure and to bill for diagnosing and treating those symptoms, with or without regard for their underlying cause. Paradoxically, it is apparently the case that the most effective treatment for AHEs associated with WTN exposure is non-medical in nature; it is to recommend that patients physically remove themselves from the vicinity of IWTs.

Statement 9: Peer-reviewed epidemiological literature is the only acceptable basis for proving a causative relationship between wind turbine noise and adverse health effects.

This issue runs as a thread through virtually all the other issues addressed in this paper, as it relates to the kind of scientific evidence frequently called for, especially in legal settings, to prove that IWTs are the cause of AHEs. While personal physicians of complainants in legal cases are often considered the only expert witnesses qualified to establish *specific causation*, others can testify to *general causation*, which is the methodology by which scientists determine whether or not an agent is responsible for producing a particular disorder. In general, this requires evaluation of the scientific and medical literature to identify documented instances of health-related conditions arising from exposure to specific agents and, when available, the dose-response relationships between agents and their effects. This process is highly similar to that of

causation assessment, as explained above, and it does not necessarily require the input of a complainant's personal physician, although such input may be helpful. In legal cases involving WTN, it is critical that expert witnesses in acoustics and health be able to reconcile their positions with the reports and standards of the WHO,[165] the International Organization of Standards (ISO),[166] and the American National Standards Institute/Acoustical Society of America (ANSI/ASA)[167] that have linked low-frequency noise to symptoms of the type involved in complaints. These acoustical documents and research reports are seldom, if ever, included in literature reviews used by the industry to deny potential health risks. If challenged on the validity of the available evidence, acousticians need to be knowledgeable of the relevant acoustical standards and make sure that they are understood by all parties. In reality, the wind industry's almost universal refusal to cooperate with researchers has made it virtually impossible to conduct proper acoustical or epidemiological studies. The industry has been largely unwilling, or claims it is unable, to shut down or modify operations of its turbines for experimental purposes. To date, such a situation has rarely occurred, most notably in the case of the Cape Bridgewater study.[25]

The veracity of Statement 9 is strongly challenged by the classic address by Sir Austin Bradford Hill,[168] Professor Emeritus of Medical Statistics, University of London, to the newly founded Section of Occupational Medicine of the Royal Society of Medicine. In his essay, Hill shared his thinking about association and causal evidence surrounding environmental disease. He posited nine elements that are critical in establishing causation:

(1) *strength* (strength of observed relationships),
(2) *consistency* (consistency, or repeatability, of relationships, based on observations by different persons, in different places, under different circumstances, and at different times),
(3) *specificity* (causation is indicated if the association is limited to specific individuals and to particular sites and types of disease and there are no associations with other factors),
(4) *temporality* (there is a clear temporal relationship between outcomes and periods of exposure and non-exposure),
(5) *biological gradient* (a dose-response relationship exists),
(6) *plausibility* (causation is more likely when certain outcomes are biologically plausible, or possible, a caveat being that plausibility depends on the biologic knowledge of the day; this element is best expressed in the statement: "When you have eliminated the impossible, whatever remains, however improbable, must be the truth" (p. 10),

(7) *coherence* (the cause-and-effect interpretation of data should not seriously conflict with generally known facts of the natural history and biology of the disease),
(8) *experiment* (experimentation or semi-experimental evidence, even if only occasional, can reveal the strongest kind of evidence for causation), and
(9) *analogy* (the recognition that similar cause-effect relationships have occurred under similar conditions).

Hill states:

> "What I do not believe (is) …that we can usefully lay down some hard-and-fast rules of evidence that must be obeyed before we can accept cause and effect. None of my nine viewpoints can bring indisputable evidence for or against the cause-and-effect hypothesis and none can be required as a *sine qua non*. What they can do, with greater or less strength, is to help us to make up our minds on the fundamental question – is there any other way of explaining the set of facts before us, is there any other answer equally, or more, likely than cause and effect?... No formal tests of significance can answer those questions. Such tests can, and should, remind us of the effects that the play of chance can create, and they will instruct us in the likely magnitude of those effects. Beyond that they contribute nothing to the 'proof' of our hypothesis" (p. 299).

Hill makes this final observation in his essay:

> "All scientific work is incomplete – whether it be observational or experimental. All scientific work is liable to be upset or modified by advancing knowledge. That does not confer upon us a freedom to ignore the knowledge we already have, or to postpone the action that it appears to demand at a given time" (p. 300).

Extrapolating from Hill's essay, the totality of our knowledge gained from the available evidence must be considered when examining the link between WTN and AHEs. Fortunately, in addition to experimentation, this evidence includes simple tools that are useful, particularly if we are willing to recognize their collective value. Those tools begin, but do not end, with adverse health reporting.

Dr. Carl Phillips, a specialist in epidemiology and science-based policy making, and a former professor of public health, has stated:[169]

> "In cases of emerging and unpredictable disease risk, adverse event reports are the cornerstone of public health research. Since it is obviously not possible to study every possible exposure-disease combination using more formalized study methods, just in case an association is stumbled on, collecting reports of disease cases apparently attributable to a particular exposure is the critical first step" (p. 304).

He gives familiar examples of hazards revealed by adverse event reporting, including infectious disease outbreaks and side effects from pharmaceuticals. He points out that:

> "Pharmaceutical regulators rely heavily on clearinghouses they create for adverse event reporting about drug side effects (and often become actively concerned and even implement policy interventions based on tens of reports)" (p. 304).

Phillips indicates that the case of wind turbines and health fits the same pattern. He describes adverse event reporting as a special type of case study—sometimes denigrated as anecdotes—that generally reports on the rapid onset of a disease that appears to be related to a particular exposure. He advocates self-reporting of adverse events as a highly useful approach in studying the health effects of wind turbines. In addition, he advocates the use of case-crossover experiments as useful and well-accepted sources of epidemiologic information, stating that they are intuitively recognized by both experts and laypersons seeking to assess whether an exposure is causing specifiable outcomes.

Other forms of evidence, all considered scientific, have been or can be used to determine the impacts of WTN on health. These include case studies, case-series studies, and other pre-experimental, quasi-experimental, true experimental, correlational analysis, and single-subject designs. Single-subject designs, like the case-crossover design used by epidemiologists, can also be applied across multiple individuals to reveal relationships between specific interventions and changes in outcomes in individuals or groups. In both designs, subjects serve as their own controls while crossing over from one treatment to another (A vs. B) during the course of the experimental trial. Both are flexible designs and useful in studying events that are infrequent or sporadic. Numerous individuals living near IWTs have experienced health symptoms that have waxed and waned during repeated cycles of exposure (A) and non-exposure (B), which indicates that the wind industry has unwittingly engaged individuals and families worldwide in a series of quasi-empirical studies for many years, without obtaining informed consent from un-enrolled subjects, typically by downplaying any concerns about potential health impacts. The outcomes from these experiments offer some of the strongest evidence available that there is a causative link between WTN and AHEs in some individuals.

According to the WHO,[170] epidemiology is "the study of the distribution and determinants of health-related states or events (including disease), and the application of this study to the control of diseases and other health problems. Although the randomized clinical trial (RCT) is generally considered the *gold standard* of designs for establishing causation, various methods can be used to carry out epidemiological investigations: surveillance and descriptive studies can be used to study distribution; analytical studies are used to study determinants." Epidemiology uses a

systematic approach to study the differences in disease distribution in subgroups and allows for the study of causal and preventive factors.[171] Descriptive epidemiological studies describe the occurrence of outcomes, and analytical studies reveal associative linkages between exposure and outcomes. Descriptive studies include primarily case reports and case-series studies. Analytic designs include experimental studies such as community trials and randomized controlled clinical trials, and observational studies, in which observations can be made retrospectively, concurrently, or prospectively. Observational studies include those in which either grouped (i.e., ecologic) or individual data are collected, the latter normally favored by the scientific community. Those designs involving individual data include cross-sectional, cohort, case-control, and case-crossover studies. Although epidemiological studies rely on statistical analyses of relationships between exposure to specific agents and AHEs in relatively large samples of the population, they are not aimed at revealing the cause of a disease or disorder in specific individuals. A cogent summary of research designs used in *evidence-based medicine* can be found online.[172]

Cross-sectional studies survey exposures and disease status at a single point in time in a cross-section of the population. They measure prevalence, not incidence, of a disease process, and have the disadvantage of difficulty in establishing the temporal sequence of exposure and effect. Also, rare and quickly emerging events may be difficult to detect. Their major advantage is that data can be collected at the same time on all participants, which means the study can be completed in a relatively short time. Notably, several cross-sectional investigations of the effects of WTN exposure have been reported.[44, 97, 98, 99, 104, 149] These studies serve as major contributions to the scientific literature on the subject.

Cohort studies involve an observational design in which a sample of the population is followed to discover new events.[75] They compare individuals with a known risk factor or exposure with others without the risk factor or exposure and aim to determine whether there is a difference in the risk, or incidence, of a disease over time. They tend to be the strongest observational design, especially when the data are collected prospectively, as opposed to retrospectively. Compared to the cross-sectional design, cohort studies tend to require more time, which partially explains the paucity of such studies involving wind turbine exposure.

Case-control designs compare exposures in diseased cases vs. healthy controls from the same general population. Specific disease states must be known prior to initiation, and exposure data must be collected retrospectively. This design can be applied to cases of IWT exposure, despite the fact that it requires the cooperation of affected and unaffected segments of the same population, a circumstance made difficult by attempts on the part of energy companies to

maintain confidentiality and privacy as a means to facilitate wind turbine development in areas involving both participants and non-participants.

In case-crossover studies, which are a special type of case-control design, the *case* and *control* components reside in the same individual. This design is especially useful in investigating triggers of a disease process within an individual. In the behavioral sciences, it is commonly referred to as a *single-subject design*, as already described. The case component signifies the hazard period, which is the time period before the disease or event onset (e.g., exposure to IWTs), and the control component signifies a specified time interval other than the hazard period, namely the non-exposure interval. As already mentioned, wind companies themselves have unwittingly subjected residents to the basic conditions of this design, and results clearly suggest that exposure to WTN leads to a variety of health complaints in some individuals and families. Phillips[79] argues that:

> "A case-crossover study is one of the most compelling sources of epidemiologic data. It consists of observing whether someone's outcomes change as their exposure status changes. This is often not possible because the outcomes only happen a single time as a result of long-term exposure (e.g., cancer) or the exposure cannot be changed. But the observed effects of turbine exposure lend themselves perfectly to such studies because the exposure is transient and the effects, while not instantaneous in their manifestation or dissipation, are generally transient over a period of days or weeks at most. Thus, unlike a case of a lifelong exposure or non-transient disease, where we can only make one observation about disease and outcome per person, the effects of turbines allow multiple observations by the same person, including experimental interventions" (p. 305-306).

Turning to experimental designs, the clinical trial is considered the ideal design to test hypotheses of causation. In a clinical trial, the investigator has control of the exposure to an extent similar to a laboratory experiment. The subjects generally are randomly assigned to one of at least two groups, an experimental and a control group. The experimental group receives the treatment (i.e., exposure in the case of wind turbines) and the control group does not; instead, it usually is subjected to a condition that simulates a generic treatment of some type, and the purpose and procedures of the control condition are explained only after the experiment ends.

A fully developed clinical trial of residents who live near wind turbines has never been conducted, and the reasons are fairly clear if we consider the circumstances surrounding such a trial. In a rigorous trial done to establish the link between AHEs and WTN, the investigator would randomly assign hundreds of people selected from the general population—including adults and children, elderly adults, and chronically ill adults—to either an experimental or a control group. Randomization would control for pre-experimental biases toward or against wind

energy, as well as for other factors that could confound the outcome. The experimental group would be required to spend a significant period (day and night for weeks or months) in homes located between approximately 1,000 ft. and several miles from the nearest wind turbine. The control group would be required to take up residence several miles or more away from the nearest wind turbine, where they would presumably be free from any effects due to extraneous noise or infrasound. Homeowners who leave their homes, as well as research participants occupying those homes, would have to adjust to new residences and modify their work and school activities, eating patterns, and overall lifestyles. Participants in both groups and at least some of the homeowners who vacate their homes for the experiment would have to be reimbursed for their participation, as well as for the costs incurred as a result of their participation, and the research staff would also have to be paid. To maintain some control across sites, the average age and health status within each group should be equivalent, and data would have to be gathered regarding such factors as turbine size, wind speed and other weather conditions, length of time the turbines were operating, terrain, the exact distance of each participating family from the nearest turbines, and actual noise levels present outside and inside the homes. Scientifically rigorous methods for measuring low-frequency noise and infrasound would have to be agreed upon and used. Although self-report via a survey technique could be part of the experimental design, medical examinations and physiological measurements, including sleep studies, should also be incorporated into the research protocol.

While possible, it is not practical to expect such a study design, in its ideal form, to be implemented. Aside from the difficulty of recruiting and enrolling enough families in enough geographic areas to form statistically strong samples, legitimate ethical questions should be raised regarding the exposure of individuals, especially children and other vulnerable individuals, to potentially hazardous conditions. One might conjecture, however, that consent to participate in such a study could be gained from fully informed adults because the effects of WTN are widely believed to be reversible when a period of non-exposure follows a period of exposure.

Statement 10: The nocebo effect, a manifestation of psychological expectations, explains why people complain of adverse health effects when living near wind turbines.

This statement is the core position of some of the most outspoken critics of the view that IWTs cause AHEs. Any discussion of this statement should begin with an acknowledgment that human behavior and beliefs are highly variable and are often driven by psychological and emotional influences, and not just by observations, logic, intellectual knowledge, or cognitive thought processes. It is not surprising, therefore, that some have adopted the view that negative reactions

to wind turbines are based primarily or solely on psychological expectations. Our analysis of the limited literature on the topic leads us to state unequivocally that it is lacking in scientific rigor. Even if the results were as described, the existing studies and observations do not support a conclusion that psychological forces are the only or even primary explanation for most of the negative reactions toward IWTs. Here, we will critically review four papers, all supporting a psychological explanation for the negative reactions.

Chapman et al[173] tested four hypotheses relevant to psychogenic explanations of the variable timing and distribution of health and noise complaints about wind farms in Australia. They obtained records from the wind companies of complaints about noise or degraded health from residents living near 51 wind projects operating between 1993 and 2013 and corroborated those records with complaints documented by three government public agencies, news media records, and court affidavits. Complaints were expressed as proportions of estimated populations residing within 5 km of a wind project. The authors concluded that historical and geographical variations in complaints were consistent with psychogenic hypotheses expressing health problems as "communicated diseases," with nocebo effects likely to play an important role in the etiology of complaints.

Nocebo effects are commonly described as being the opposite of placebo effects. While the *placebo effect* usually refers to a positive reaction to an inert substance—the placebo—the *nocebo effect* refers to a negative reaction to an inert substance—the nocebo. Both effects are psychogenic, but known to exert powerful influences on human physiology, behavior, and attitudes. Essentially, Chapman and his supporters believe that psychogenic reasons are the basis for health complaints about wind turbines, which they believe to be harmless.

Our major criticism of the work of Chapman et al is that wind companies typically engage in practices that discourage local residents to complain. These companies require participating residents to sign contracts before turbines are constructed and before the residents can receive compensation for leasing their land, and they often request non-participating residents to sign contracts prior to initiating a project. Those contracts, which are binding, often include gag clauses that effectively limit resident complaints. The contracts have often stipulated not only that residents refrain from voicing negative views of the wind project, but also that they support the development of future projects. Such conditions create an atmosphere in which is it is highly unlikely that the records of wind companies, governments, courts, or the media will sufficiently reflect all of the complaints that residents have and would voice under less-restrictive circumstances. We argue that the only way to gather accurate data on such complaints is through a survey of either an adequate sample of residents living near multiple wind projects or all such

residents, where residents are free of restrictions by the wind companies. Such data would allow a valid determination of the proportion of residents who experience adverse effects. Whether that proportion is large or small, we could all act on the basis of factual evidence, as opposed to incomplete observations.

Another shortcoming of the study by Chapman et al,[173] which is less well documented but a factor observed in legal cases in which the present authors have been involved, is that residents near IWT projects tend to be delayed in their responses to AHEs. Many of them believe their health problems to be linked to other causes before suspecting that the turbines are the cause. Some or most of these individuals were supporters of wind projects prior to experiencing such problems, as Phipps et al[75] noted in New Zealand. The delay factor would mean that the types of records used by Chapman et al would not likely reflect the reactions of many affected residents.

Crichton and colleagues conducted two laboratory investigations, each of which has bolstered the argument that negative reactions to audible and inaudible WTN can be explained by psychological expectations. Crichton et al[174] conducted what they described as a sham-controlled double-blind provocation study, in which participants were exposed to 10 min of infrasound and 10 min of sham infrasound. Fifty-four participants were randomized to high- or low-expectancy groups and presented with audio-visual information, using material from the Internet that was designed to invoke either high or low expectations that exposure to infrasound causes specified symptoms. High-expectancy participants reported significant increases, from pre-exposure baseline assessment, in the number and intensity of symptoms experienced during exposure to both infrasound and sham infrasound. There were no symptomatic changes in the low-expectancy group. Healthy volunteers, when given information about the expected physiological effect of infrasound, reported symptoms that aligned with that information, during exposure to both infrasound and sham infrasound. According to the authors, results suggest that psychological expectations are sufficient to explain the link between wind turbine exposure and health complaints.

Punch[175] has criticized that study as methodologically weak, on the following grounds:

(1) Subjects were never exposed to infrasound that adequately represented that to which residents near wind turbine projects are subjected. It is extremely unlikely that the employed studio woofer was capable of producing a 5-Hz stimulus; the authors did not describe or show a graph of the output spectrum. Even if a true infrasound stimulus was produced by their equipment, 40 dB (presumably SPL) was not sufficient to represent the level of

infrasound commonly produced by IWTs. Even if a sufficient stimulus had been produced to represent wind turbine infrasound, a 10-min exposure would have been meaningless in representing the duration of exposure that is likely necessary to produce any substantial health symptoms.

(2) In effect, subjects were exposed to two sham conditions. If they had been exposed to infrasound that adequately mimicked infrasound from IWTs (preferably actual IWT infrasound), subjects in both the high- and low-expectancy groups would have had a physical stimulus (in the infrasound condition) that could have overridden, or at least moderated, their psychological reactions.

(3) The design limited the study's external validity, the ability to generalize the results to other populations and situations. Most of the individuals who have reported AHEs from WTN, some of whom have abandoned their homes, are not people who were adequately warned of potential health effects prior to their exposures. In fact, most of them were likely told by the wind company to expect no harmful effects. Again, many individuals who report AHEs were advocates of wind energy prior to being exposed. Because the major premise underlying the study is that people complain of WTN based primarily on expectancies that align with prior information, the study is based on a false premise. Also, the recruitment of university students does not represent the type of subjects who are apt to complain about WTN. This population is probably the least vulnerable to the effects of WTN in that few, if any, were very young, very old, likely to have chronic health conditions, or disabled. Also, they are more likely to exhibit a response bias because they are less likely than prospective residents of a wind project to believe that they might be harmed by participating in an experiment. Furthermore, the extensive use of pretesting introduced reactive or interactive effects that could have affected post-test behaviors and ratings. Finally, the use of a laboratory setting and short exposure times, as opposed to a real-life setting in which wind turbine blades are turning at night and the subjects are inside a home, introduced situational effects that limit the ability to generalize the data. The authors admit this shortcoming in their statement:

> "… exposure to infrasound in a listening room purpose (sic) built for sound experiments may not be directly comparable to exposure to infrasound from a wind farm" (p. 4).

(4) This was an experiment whose outcomes could have been predicted, given the conditions employed. Aside from the fact that the outcome had virtually nothing to do with the real-world conditions of exposure to infrasound from wind turbines, none of the factors that influence how expectations can affect perceptions through top-down, or cognitive- based, processing, as opposed to bottom-up, or stimulus-based, processing, were controlled or even

discussed. (Interested readers should refer to Williams[176] for examples of the effects of top-down processing and for a discussion of how such experiments might be improved.)

In a second laboratory study by Crichton and colleagues,[177] similar in design to the first, the authors investigated whether positive expectations can produce a reduction in symptoms and improvements in reported health. Sixty participants were randomized to either positive or negative expectations and subsequently exposed to audible wind turbine sound and infrasound. According to the authors,

> "Participants were … exposed to infrasound (9Hz, 50.4dB) and audible wind farm sound (43dB), which had been recorded 1 km from a wind farm, during two 7-minute listening sessions. Both groups were made aware they were listening to the sound of a wind farm, and were being exposed to sound containing both audible and sub audible components and that the sound was at the same level during both sessions" (p. 2).

Prior to exposure, negative-expectation participants watched a DVD incorporating TV footage about health effects said to be caused by infrasound produced by wind turbines. In contrast, positive-expectation participants viewed a DVD that:

> "…framed wind turbine sound as containing infrasound, sub audible sound created by natural phenomena such as ocean waves and the wind, which had been reported to have positive effects and therapeutic benefits on health" (p. 2).

The authors described the results as indicating that during exposure to audible wind turbine sound and infrasound, symptoms and mood were strongly influenced by subject expectations. Negative-expectation participants experienced a significant increase in symptoms and a significant deterioration in mood, while positive-expectation participants reported a significant decrease in symptoms and a significant improvement in mood. The authors concluded that if expectations about infrasound are framed in more neutral or benign ways, then it is likely that reports of symptoms or negative effects could be nullified.

That second investigation by Crichton and colleagues has some of the same methodological weaknesses as the first, particularly with respect to the use of what was described as experimental infrasound. Again, recordings of WTN were used, and no description of the recording instrumentation was provided, leading us to assume that the instrumentation may have been incapable of accurately reproducing infrasound, and thus its true effects. All participants were informed of the purpose of the study, which was:

> "…to investigate the effect of sound below the threshold of human hearing (infrasound) on the experience of physical sensations and mood" (p. 2).

Preferably, the purpose should have been divulged only after the data were gathered because the description of sounds as those that humans cannot hear would presumably have established a mind-set, or bias, in both groups that the sound would have little impact. That preconception could have confounded any reactions to the different DVD messages. Another criticism of the study is that wind companies frame their turbines in the best possible light, so positive expectations have already been established in the minds of most wind-project participants and non-participants. Despite neutral or positive framing that has sometimes included assurance that the turbine sounds would be no louder than that of a refrigerator (see, for example, Chen & Narins[178]), the consequences of living near IWTs are catastrophic for some residents.

Tonin et al[179] repeated the experimental work of Crichton and her colleagues by using specially modified headphones to produce infrasound, as opposed to the loudspeaker system used in the previous studies, and exposed participants to 23 min of infrasound, as opposed to the 10-min exposures in the Crichton studies. Similar results were reported, suggesting that the simulated infrasound had no statistically significant effect on the symptoms reported by volunteers, while the prior expectations the volunteers had about the effect of infrasound had a statistically significant influence on the symptoms reported, thereby supporting the nocebo effect hypothesis. Some of the same criticisms of the Crichton et al study[174] levelled by Punch[175] also apply to the Tonin et al study, as participants were not being stimulated by sufficient durations or peak levels of infrasound exposure to which residents living near IWTs are exposed, and participants were effectively exposed to two sham conditions, denying them any opportunity to experience realistic infrasonic stimuli that could have overridden or moderated their psychological reactions based on expectancy.

In a related study, Taylor et al[180] assessed the effect of negatively oriented personality (NOP) traits (Neuroticism, Negative Affectivity and Frustration Intolerance) on the relationship between both actual and perceived noise on “medically unexplained non-specific symptoms (NSS)” (p. 338), presumably their euphemism for Pierpont’s Wind Turbine Syndrome.[4] Households within 500 m of 8 0.6-kW micro turbine installations and within 1 km of 4 5-kW small wind turbines in two U.K. cities were surveyed, and 138 questionnaires were completed and returned for analysis. Turbine noise level for each household was also calculated. There was no evidence for an effect of calculated noise on NSS. A statistically significant relationship was found between perceived noise and NSS for individuals high in NOP traits.

That study is similar in concept to those performed by Crichton and colleagues,[174, 177] with virtually the same conclusion—that the link between wind turbines and AHEs has a psychological origin. The study can be criticized on several grounds:

(1) Only smaller wind turbines were investigated; there is virtually no literature demonstrating that such turbines produce noise levels of any consequence to humans. The fact that no relationship was found between "calculated actual noise" from the turbines and participants' attitudes toward wind turbines was thus predictable because the noise levels were either too low to affect attitudes differentially or were completely inaudible.

(2) The authors state:

> "Actual noise turbine level for each household was also calculated" (p. 338).

Calculated levels (from noise maps) are not necessarily actual levels, so this procedure was, at a minimum, mischaracterized.

(3) It should not be surprising to find that individuals with negatively oriented personalities respond negatively to WTN, as they would likely respond negatively to almost any stimulus. However, the findings, as acknowledged by the authors, resulted from reports of participants' retrospective perceptions of noise from turbines and symptoms at the same point in time, possibly resulting in common-method variance and retrospective bias. Also, although the authors reported a statistically significant relationship between NSS and negatively oriented personality, the reported variance explained by those relationships was quite low. That finding suggests that a meaningful (i.e., clinical) significance was not established, in which case one might reasonably question whether symptom reporting in the study was actually linked to negative personality type.

(4) Among other possible confounders, individual differences are likely to have complicated the authors' analyses (see Williams[176] for an explanation).

To conclude this section, we believe that while psychological expectations conceivably can influence perceptions of the effects of WTN on health status, no scientific studies have yet convincingly shown that psychological forces are the major driver of such perceptions. Based on the bulk of literature covered in this review, those drivers are the physical stimuli themselves and the internal physiological reactions they induce.

Statement 11: Only relatively few people, if any, are adversely impacted by wind turbine noise, and the majority have no complaints.

As indicated earlier, most of the studies that have documented specified percentages of the population adversely affected by WTN have been those focusing on annoyance, as opposed to health. While the exact percentage of people whose health is affected by WTN has not been accurately determined, countless reports worldwide suggest that the acoustic energy emitted by

IWTs is harmful to the health of substantial numbers of people. As already noted, Phipps et al[75] found that 45% of households living as far away as 4 km from a wind project and 20% of households living up to 8 km away reported hearing turbine noise. Those figures take into account only the audible noise, of course, and not the inaudible infrasound, and they do not account for any documented adverse impacts.

Estimates of the percentage of people adversely affected by WTN should not be based solely on questionnaire surveys of populations known to be experiencing health problems, due to selection bias. Such surveys can be helpful in arriving at rough estimates of AHEs, however, but only if those surveys also report estimates of the total population from which the affected sample is drawn. The main value of surveys that include only affected individuals (e.g., Harry[74]; Pierpont[4]; The Acoustic Group[25]) is that they strongly suggest that substantial numbers of people living near wind turbines suffer health symptoms. For example, Harry[74] reported that 81% of her 42 survey respondents had health complaints, 76% had visited a doctor regarding those complaints, and 73% reported a reduced quality of life. In a somewhat more representative survey of residents living within 15 km of a wind turbine project—most of whom lived within 3 km—Phipps[76] found that 42 of 614 households who responded to a questionnaire (6.8%) reported occasional sleep disturbance, another 21 (3.4%) reported frequent sleep disturbance, and an additional 5 (0.8%) reported sleep disturbance most of the time due to WTN. Eleven percent of households, therefore, reported suffering at least occasional sleep disruption due to the wind turbines. Fifteen percent of respondents to that survey reported that they had suffered at least occasional reductions in their quality of life since the turbines became operational.

Despite the lack of definitive scientific evidence, we cannot ignore the numerous accounts of such effects reported worldwide on the Internet, in legal proceedings, and in news accounts. Krogh et al[96] have reviewed studies that document such incidents, many of which have involved the abandonment of homes. In a 2010 report commissioned by the Ontario Ministry of the Environment, the engineering firm of Howe Gastmeier Chapnik Limited,[112] despite its general conclusion that Ontario IWTs do not pose a risk to human health, stated:

> "The audible sound from wind turbines, at the levels experienced at typical receptor distances in Ontario, is nonetheless expected to result in a non-trivial percentage of persons being highly annoyed …. research has shown that annoyance associated with sound from wind turbines can be expected to contribute to stress related health impacts in some persons" (p. 39).

In conclusion, we should recall that Phillips[169] advocates self-reporting of adverse events as a critical element in the study of the health effects of wind turbines. As stated earlier, he has noted

the importance of case-crossover experiments as useful and well-accepted sources of epidemiologic information. Numerous households around the world have been subjected to this type of quasi-experiment by the wind industry. It is unfortunate that an accurate count of these incidents has never been tallied formally and scientifically. Although that task must be left to future research, we should regard complaints of AHEs from individuals living near wind turbine installations seriously, when they occur, and the wind industry must act responsibly by siting its turbines at distances from residents that protect health and quality of life.

It is widely accepted that the industry has warned that tighter siting restrictions will destroy its prospects for growth. Such growth, however, should not continue in areas where there are probable and potential risks to human health. There are regions of the U.S. and other countries where turbines can operate safely, presumably without such risks. Some examples of those sites are illustrated in Figure 2.

Statement 12: There is no evidence in the literature to support a causative link between wind turbine noise and adverse health effects.

The above review has been aimed specifically at addressing this point, which is often cited as factual by wind industry advocates in the literature and in legal proceedings. Namely, there is an abundant literature, much of it peer-reviewed and authored by highly reputable researchers, indicating that audible and inaudible noise emitted by IWTs adversely impacts the health and well-being of substantial numbers of people who are regularly exposed to wind turbines. It is clear that the literature reviews and papers claiming no AHEs fail to include important studies, international standards, guidance from the WHO, and research conducted on wind turbine noise and other sources of infra- and low-frequency sound. Whether this is through oversight or calculation, only reports that cite scientifically credible references should be considered legitimate sources of information. Our review has shown that it is unacceptable simply to state that the literature contains little or no evidence of a causal link between WTN and AHEs. At a minimum, those effects have been shown to be regularly correlated to living in proximity to IWTs, and there is sufficient evidence that those effects are highly associated with objective measurements of audible noise and infrasound.

Although sleep disturbance and its associated impacts on health and quality of life appear to be the most salient consequences of IWT noise, varying health effects that are unrelated to sleep have also been widely and consistently reported by different investigators. While not everyone who is exposed to IWTs suffers AHEs, it is incumbent on governmental officials and the wind industry to take seriously the health implications of their decisions to locate wind turbines near

residential and other populations, especially vulnerable populations, that are or likely to be negatively affected.



Figure 2. Photographic images of sites illustrating onshore landscapes where industrial wind turbines expose humans to minimal health risks due to large setback distances. Note that homes are not seen in the photos. (Source: https://images.search.yahoo.com/search/images?p=wind+turbine+images+california&fr=tightropetb&imgurl=http%3A%2F%2Fwww.freefoto.com%2Fimages%2F39%2F01%2F39_01_1---Wind-Turbine-Generators--Palm-Springs--California_web.jpg#id=36&iurl=http%3A%2F%2Fmedia-cdn.tripadvisor.com%2Fmedia%2Fphoto-s%2F01%2F70%2Ff9%2Fbb%2Ftehachepi-area-california.jpg&action=close).

Conclusion

We have discussed in this paper various elements of acoustics, sound perception, sound measurement, and psychological reactions, and the role these factors play in support of the view that a general-causative link exists between human health and ILFN emitted by IWTs. The available evidence warrants the following conclusions:

(1) Large wind turbines generate infrasound, which is not normally experienced as sound by most human listeners. Some people, however, experience it in the form of pathological

symptoms such as headache, dizziness, nausea, or motion sickness, which appear to be caused by the excitation of resonances inside closed structures and the human body itself.

(2) WTN has unique acoustic characteristics when compared to other environmental noises. These characteristics include low-amplitude, amplitude-modulated, intermittent occurrences of tones that mirror the peak energy of the blade-pass frequency and the first several harmonics. The coupling mechanisms in the inner ear prevent internally generated sound, but not externally generated sound, from being perceived, which means that perception of wind turbine infrasound is far more disturbing than infrasound generated within the human body.

(3) There is voluminous evidence, ranging from anecdotal accounts from around the world to peer-reviewed scientific research, that audible and inaudible low-frequency noise and infrasound from IWTs lead to complaints ranging from annoyance to AHEs in a substantial percentage of the population. Although sleep disturbance is the most common problem cited, a variety of other health problems has been reported by numerous reputable sources. Recent research is largely consistent with Pierpont's original description of Wind Turbine Syndrome. Research on humans and lower animals has shown that it is biologically plausible that inner ear mechanisms, in conjunction with the brain, can process acoustic energy in ways that result in pathological perceptions that are not interpreted as sound. Both balance and hearing mechanisms appear to be involved in evoking these perceptions. The findings that infrasonic stimuli can amplitude modulate higher frequencies in the audible region, and that infrasound may be more perceptible when higher frequencies are absent, are especially compelling in suggesting that what we can't hear can hurt us.

(4) To prevent AHEs, scientists have recommended that distances separating turbines and residences be 0.5-2.5 mi., and 1.25 mi. (2 km) or more has been commonly recommended. Clearly, the short siting distances used by the industry for physical safety do not protect against AHEs. Alternatively, researchers have recommended sound levels typically ranging from 30-40 dBA for safeguarding health, which is consistent with the recommendation of nighttime noise levels by the WHO.

(5) Annoyance is a health issue for many people living near IWTs, which is consistent with both the WHO's definition of health and contemporary models of the relationships among annoyance, stress, and health.

(6) The scientific evidence regarding factors other than amplitude-modulated ILFN as an explanation for most of the health complaints near IWTs, including electromagnetic fields (dirty electricity), is weak; the preponderance of research suggests that ILFN is the most viable explanation for such complaints.

(7) The A-weighted decibel scale, which effectively excludes infrasound and substantial amounts of low-frequency noise, is inadequate to predict the level of outdoor or indoor infrasound, to reveal correlations to infrasound, or to show a definitive relationship with AHEs. Achievement of these goals requires the development of new measurement methods.

(8) Even though Wind Turbine Syndrome is not currently included in the ICD coding system, that system includes most of the acknowledged symptoms of the syndrome. Medical professionals, therefore, have the necessary tools to evaluate and treat it, and that process has already begun on a limited scale.

(9) While some epidemiologically solid research has been done in the area of IWTs and AHEs, evidence from other sources cannot be ignored. Hill noted the nature of such sources in 1965, and Phillips, in 2011, described the importance of other kinds of evidence, including adverse event reports, in establishing a causative relationship. One of the strongest types of evidence is the case-crossover experimental design, which the wind industry has unwittingly imposed for years on multiple families, many of whom have abandoned their homes to escape IWT noise exposure.

(10) While psychological expectations and the power of suggestion conceivably can influence perceptions of the effects of WTN on health status, no scientifically valid studies have yet convincingly shown that psychological forces are the major driver of such perceptions.

(11) Accurate estimates of the percentage of people who are affected by IWTs exist only for annoyance, not AHEs. Multiple reports, however, emphasize the relationships that exist between annoyance, stress, health, and quality of life, and indicate that a non-trivial percentage of people who live near IWTs experience AHEs. Those reports are consistent with thousands of reports worldwide. Although it seems reasonable to conclude that noise from IWTs does not cause AHEs in the majority of exposed populations, and that accurate estimates of AHEs are yet to be established, it is also clear that considerable numbers of people are affected and that they deserve to be heard and protected from adverse health impacts.

(12) The available literature, which includes research reported by scientists and other reputable professionals in peer-reviewed journals, government documents, print and web-based media, and in scientific and professional papers presented at society meetings, is sufficient to establish a general causal link between a variety of commonly observed AHEs and noise emitted by IWTs.

Based on all the evidence presented, our fundamental view is that the controversy surrounding AHEs should not be polarized into two groups consisting of either *pro-wind* or *anti-wind*

factions, but rather one in which there is room for a third, *pro-health*, perspective. Essentially, the pro-wind view is that IWTs should be installed wherever feasible, that definitive scientific research is lacking to indicate that turbines cause AHEs, and that if you can't hear it, you can't feel it. The anti-wind view is that IWTs should not be installed anywhere because wind is not an economically viable source of renewable energy, that all government subsidies and development efforts should end, and that what we can't hear can hurt us. A pro-health view is that there is enough anecdotal and scientific evidence to indicate that ILFN from IWTs causes annoyance, sleep disturbance, stress, and a variety of other AHEs to warrant siting the turbines at distances sufficient to avoid such harmful effects, which, without proper siting, occur in a substantial percentage of the population. That view holds that what we can't hear can hurt some of us, and that the precautionary principle must be followed in siting IWTs if such health risks are to be avoided. Industrial-scale wind turbines should not be located near people's homes, educational and recreational facilities, and workplaces. It is our belief that the bulk of the available evidence justifies a pro-health perspective. It is unacceptable to consider people living near wind turbines as collateral damage while this debate continues.

Further scientific investigations of the dose-response relationship between IWT noise and specific health effects in exposed individuals are sorely needed. However, people should be protected by conservative siting guidelines that recognize the concerns raised in this review. Hopefully, such research can and will be planned and executed by independent researchers with the full cooperation of the wind industry. The major objective of such research should be to reveal directions for the industry in balancing the energy needs of society with the need to protect public health.

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Comments on Recommended Amendments to Section 4.3.76 Shiawassee County Zoning Ordinance, Article 4, Specific Use Regulations

Prepared On Behalf of:

Regulated Wind of Shiawassee County (RWSC)

By: Richard James, E-Coustic Solutions LLC, Okemos, MI

Date: March 27, 2018

INTRODUCTION

This statement has been prepared at the request of Mr. Josh Nolan, attorney for Regulated Wind of Shiawassee County (RWSC). It:

- Provides comments on the August 2017 and March 2018 drafts of the regulations prepared by the Planning Director,
- Provides support for the suggested changes in Mr. Nolan's March 2018 redline comments on the March 20, 2018 revised draft of the proposed regulations,
- Provides a review of new research showing the impact of operating wind utilities on people in other communities, and
- Rebuts representations in the documents submitted by RSG and Hankard Environmental on behalf of DTE Energy and Trade Wind Energy regarding wind turbine noise characteristics, proper thresholds to prevent annoyance and adverse health impacts, and suggestions for measurement procedures, that are incomplete, misleading, or misrepresent the recommendations of the sources upon which their opinions are founded.

QUALIFICATIONS

This statement was prepared by Richard R. James, principle acoustician, E-CS LLC, with over 45 years of experience with community noise from manufacturing operations. A summary of qualifications is provided as the first attachment to this statement. Testimony was provided earlier in this process to the Shiawassee County Planning Commission in April of 2017. A written document dated April 26, 2017, was also provided to expand on my oral testimony titled: "Shiawassee County Planning Commission, Comments in Support of Proposal 2".

NEW INFORMATION RELATING SOUND LEVELS AND DISTANCE TO ANNOYANCE AND AUDIBILITY

Before I address the proposed sound level criteria in the two drafts of the Shiawassee regulations, and the comments and suggestions from Mr. Nolan and RWSC, the three wind energy companies,

and their consultants, I would like to briefly review new information regarding criteria, annoyance, audibility and appropriate distances between wind turbines and properties that may be used for residential purposes. Selecting a threshold for the Shiawassee County regulation may only repeat mistakes of the past unless we consider what has been learned about annoyance and audibility over the past several years as projects have been constructed and operated.

PRIMARY CHARACTERISTIC OF WIND TURBINE SOUND THAT REQUIRES LIMITS

Most complaints about wind turbine noise audibility and annoyance center on the fluctuating sounds produced during commonly occurring weather and operating conditions. This is seen in the top part of Figure 1 (see attached Figures) where the dBA level for the wind turbines is modulating as much as 8 dBA over a period of less than one minute. The rising and falling sound levels are associated with the "whooshing" and "thumping" sounds reported in complaints by people living in proximity to industrial wind turbines.

It should be noted that fluctuation in sound level is known to increase annoyance above what is expected for steady sounds. This characteristic often incurs a 5-dBA penalty in community regulations. If wind turbines did not have this characteristic, and instead produced a steady and non-tonal sound all the time, simple averaged sound level criteria might be useful as methods to limit complaints of annoyance and audibility. However, experience has shown that fluctuating sound is a primary characteristic of modern utility scale wind turbines, rendering "average" sound level limits inadequate.

In Figure 1 the modulation is in the range of 3-5 dBA about every 1.3 seconds (depends on hub rotation speed) and over the short period presented has a modulation depth of eight (8) dBA.

Looking at the graph at the bottom showing the sound pressure level at each 1/3rd octave band, we find that the lowest frequencies (the ones on the left side) are significantly higher than those in the middle (speech frequencies) or high frequencies (the ones on the far right). Starting at the left side, the first five (5) octave bands, from 6 Hz to 16 Hz, have the highest sound pressure levels and cover the range considered to be infra sound. Then, over the range of 20 Hz to 200 Hz the low frequency sound pressure levels continue to drop as frequency increases. This is the second characteristic of wind turbine sound that should be noted - it is dominated by infra and low frequency sound content that propagates further and can be heard inside homes even at considerable distances. Thresholds that only consider dBA weighted sound levels cannot control for the low frequencies, which is why criteria using dBC weighting is required to properly regulate wind turbine sound. In the section below on Annoyance we will see that new research has demonstrated the importance of limiting these fluctuations to protect against annoyance and sleep disturbance.

It is the fluctuating character of wind turbine noise that has led to calls for criteria based on the

maximum sound level (LAMax) as is being considered in the Shiawassee proposal. It is the infra and low frequency sound content that has led to suggestions by RWSC for criteria that consider that characteristic by setting a dBC weighted threshold.

RECENT DEVELOPMENTS IN SOUND CRITERIA

Regarding thresholds using averaged sound levels, 40 dBA Leq is a common limit in many countries. That limit has not prevented the installation and operation of wind turbines in those jurisdictions. Careful planning and, if necessary, agreements with adjacent land owners has allowed for operation of wind projects in all of these jurisdictions. For example, Canada, U.K., Australia, New Zealand, Denmark, Netherlands, Germany, and here in the US, states, counties and townships have set thresholds of 40 dBA Leq or less.

In 2012, Massachusetts formed an expert panel to determine the thresholds for wind turbines, which at that time were primarily 1.5 and 2.0 MW models. Table 4 from that study (See Figure 2 in the Figures Attachment) presents suggested limits of less than 40 dBA Leq for properties with residential development. In 2013, two well respected acousticians who have influenced many community noise regulations in the US over their careers, George Hessler, Sr., (Hessler and Associates) and Dr. Paul Schomer, (Emeritus Director of the Acoustical Society of America's Standards Committee) recommended that a wind turbine sound limit of 40 dBA Leq or less be set to protect against adverse health effects.[1] They used different methods to arrive at this threshold. However, both concluded that 40 dBA Leq was the highest limit that should be permitted to protect public health[2].

Limits that exceed 40 dBA Leq are found in some regions of the US, especially where the regulations were established prior to any experience with wind energy projects. But, not all regions accepted high thresholds and recently they are trending downward. For example, Oregon has had a limit of 35 dBA (L_{50}) since the early 2000s, while Vermont just recently reduced its limits to less than 40 dBA Leq. Other jurisdictions are also finding that limits allowing higher sound levels result in significant public complaints. Consider for example, the situation in Huron County, Michigan, where townships have passed regulations with lower limits than the county to prevent annoyance and other forms of complaints. Experience in that county shows that if Shiawassee County elects to

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[1] Criteria for wind-turbine noise immissions, ICA 2013 Montreal, June 2013 published by the Acoustical Society of America

[2] "Hessler comes up with a single, 24-hour A-weighted average criterion of 40 dB, and Schomer comes up with a 24-hour, A-weighted average criterion of 39 dB."

set a threshold using 45 dBA Leq or higher, the County can expect that wind turbine noise complaints will lead to similar results. Does Shiawassee County plan to have similar debate and political unrest as has occurred in Huron County? That can be expected if it elects to promulgate wind project sound limits insufficient to limit complaints and that do not allow for easy enforcement.

As we will see in the review that follows of recent research regarding annoyance, limits specified as Leq (averaged) sound levels, even those where the limit is 40 dBA Leq, have not resulted in acceptable levels of wind turbine sound at residential properties. This is because criteria in dBA Leq do not control the most troublesome characteristics of wind turbine noise. Permitting higher thresholds than 40 dBA Leq will produce higher levels of complaints. Higher limits reduce the setback distance between wind turbines and homes putting people's property and homes closer to the machines making the sound received higher.

RECENT STUDIES OF ANNOYANCE AND AUDIBILITY

Much of the literature on wind turbine noise and its impact on people centered on European research that focused on earlier models of wind turbines installed in the late 1990s and early 2000s. The wind turbines being installed today are much larger in size, especially blade length and height than those of the early studies. In the past two years, new studies have been conducted that look at the impact of wind turbines as large as 3-5 MW and also the smaller ones with capacities of 1.5 MW and above.

Before presenting the results of those test we need to understand the meaning of phrases like "Very" or "High" Annoyance. Annoyance, in the way it is used in acoustical and social research is different from the "annoyance" we associate with common daily irritations. This is a phrase used in the studies to represent a level of aggravation that is sufficient to be considered an adverse health effect. It is a higher threshold than mild annoyance. Mild annoyance does not often result in complaints to public officials or cause adverse impacts on a person's health.

The percent of the study population with High Annoyance is abbreviated as %HA. Since 2016 several new studies based on interviews with people living near wind turbines have been published. Two of the studies presented here correlate the %HA to the sound level at the receiving property predicted using computer models. That makes them particularly useful for thresholds in Shiawassee County intended to establish design goals. The developer's will use similar computer models in their applications for permits.

The graphics to support the following are included as Figures 3 to 5 of the attached Figures. In Figures 3 and 4 High Annoyance is represented as the percent of the population (%HA). In Figure 5 the phrase "Very Annoyed" is used to represent the most annoyed class of respondents.

The first study was conducted by Health Canada of people living in and around wind projects in

Ontario where the limit is 40 dBA Leq. Health Canada plays an equivalent role in Canada to the Centers for Disease Control in the US. Figure 3 of the Figures Attachment shows a graph of the study's findings regarding High Annoyance (vertical axis) versus the sound level predicted by the computer models (horizontal axis). The red annotation was added for this document. The vertical red line at the 40 dBA Leq level shows 10%HA. That is a large increase in the %HA from the 1-2%HA seen for Leq's of less than 40 dBA. However, relaxing the sound limits to permit 45 dBA Leq the annoyance increases from 10% to almost 14%. Higher levels would be expected to increase the %HA even more.

The second graph presents the findings of a study done by researchers in Finland using data for wind projects in Germany. Figure 4 of the Figures Attachment shows a graph similar to what we see from the Health Canada study. It also shows a sharp rise in %HA as predicted sound levels increase from under 40 dBA Leq. Extrapolating the trend line the red markup shows that at 40 dBA Leq the %HA is over 10%. For Leq's under 40 dBA the %HA is lower, approximately 2-3% at 35 dBA Leq.

The findings of a third study are presented in the two slides of Figure 5. This study was conducted by RSG, who also provided comments on behalf of DTE Energy. The graphics are two slides from a presentation on the study presented as a webinar in February 2018. The slides are not presented as graphs but instead report the findings of the study for various setbacks, from 3-5 miles (top) to under ½ mile (bottom). The most relevant class is the group who live within ½ mile of a wind turbine. This study's findings are similar to those of the two studies above but expressed in terms of distance instead of sound levels.

Table 1-Summary of New Research below merges the proposed criteria for wind turbine noise to sound levels showing that the noise has impacts from severe to modest depending on sound levels at the receiving property, which can be correlated to separation distance. The table organizes the findings reported in each of the three studies to permit visual inspection for trends.

Table 1-Summary of New Research

Leq (dBA)	Leq+10=Lmax (LAMax)	Approx. Setback[5] needed to meet dBA criteria (feet)	% Highly Annoyed (Health Canada [1])	% Highly Annoyed (Finland /Germany[2])	% Very Annoyed (US study by DTE's RSG[3])	% Hearing Audible WT Outside/Inside (US study by DTE's RSG[3])
35 Leq	**45 LAMax**	3700 ft. per RSG	1%HA	1-3%HA	At least 3% Very Annoyed 20% Mildly Annoyed (1/2-1 mile)	At least 40% Outside 20% Inside (1/2-1 mile)
40 Leq	**50 LAMax**	1850 ft.	10%HA	>10%HA	(less than ½ mile) 20% Very Annoyed 20% Mildly Annoyed	(less than ½ mile) 75% Outside 50% Inside home
45 Leq	**55 LAMax**	925 ft.	13.7%HA	20%%HA		
50 Leq	**60 LAMax**	460 ft	Limited data[4]	Limited data[4]		

1 Michaud D, et al, "Exposure to wind turbine noise: Perceptual responses and reported Health Effects,"

March 2016, JASA, A study conducted for Health Canada.

2 Hongisto V, Oliva D, Keranen J, "Indoor noise annoyance due to 3–5 megawatt wind turbines—An exposure–response relationship," Oct. 2017, JASA

3` Haac R, Kaliski K, Landis M, (RSG), Hoen B (Lawrence Berkeley National Laboratory), "Predicting Audibility of and Annoyance to Wind Power Project Sounds Using Modeled Sound," For Wind Energy Technologies Office of USDOE, February 27, 2018 Webinar

4 Regulatory thresholds of 40 dBA Leq or lower in countries studied so data for annoyance to higher sound levels is limited. Observed trends can be expected to continue.

5 Distances have been estimated based on this commentator's experience gained from reviewing numerous Noise Impact Studies conducted for other projects in the US, Canada and other countries. The assumption is: starting with RSG's statement that a 35 dBA Leq limit would require a setback of 3700 feet. The sound levels increase by about 5 dBA for each halving of the setback distance required to meet that criteria.

The first two columns show the Leq and LAMax sound levels that can be used for siting thresholds. There is a 10-dB difference between them established using RSG's comment in the DTE documents that a LAMax limit would be 10 dB higher than a Leq limit. In the same document, RSG notes that for the situation of a 35 dBA Leq limit would require a 3700-foot separation distance. This was used to establish the starting point in column 3 for the setback distances needed for each threshold in the two left hand columns. It is then assumed that for each 5 dBA increase in the threshold sound level, the separation distance will decrease by half.

Thus, for the 40 dBA Leq threshold (50 LAMax) the distance scales to 1,850 feet (less than ½ mile), for the 45 dBA Leq threshold (55 LAMax) the distance scales to 925 feet and then to 460 feet at 50 dBA Leq (60 LAMax). Based on this analysis, setting the threshold at 45 dBA Leq would permit a wind turbine to be as close as 925 feet to a non-participating property.

The right hand four columns present the findings of the three studies discussed above aligned to the criteria levels and distances in the three left columns. In each case, we find that when the permitted threshold exceeds 35 dBA Leq (45 LAMax) the percent highly annoyed (%HA) rises from 1-3% to over 10%. **Selecting criteria that allows exposing 10% or more of the population to noise that poses such high levels of annoyance and risks of adverse health effects is a failure to protect the health, safety and welfare of the population**. As seen in the two far right columns showing results of the RSG study, even at distances of over ½ mile 3% are very annoyed, 20% can hear the wind turbines inside their homes and 40% can hear them on their property. This shows that criteria above 35 dBA Leq (45 LAMax) that result in separation distances of less than ½ mile are inadequate to protect public health and welfare.

This observation is supported by a fourth study conducted in a Sleep Laboratory. Test subjects slept in a room where wind turbine sounds were reproduced, including fluctuating and low frequency characteristics. This study: "Physiological effects of wind turbine noise on sleep" by Smith, Ogren, Thorsson, Pedersen, and Persson-Waye, published in the Proceedings of the 22nd International Congress on Acoustics in September of 2016 concluded:

"Physiological measurements indicate that nights with low frequency band amplitude modulation and LAEq,8h =45 dB, slightly open window (LAEq,8h=33dB indoors) impacted sleep the most. The presence of beats and strong amplitude modulation contributed to sleep disturbance, reflected by more electrophysiological awakenings, increased light sleep and wakefulness, and reduced REM and deep sleep"

This confirms what the studies in Table 2 are showing. Leq, or averaged sound levels, are not related to the characteristic of wind turbine noise that causes the complaints. It shows why a threshold set as not to exceed limits is necessary and specified for both dBA and dBC weighting. First, to limit the fluctuations in the sounds received at non-participating properties, and second, to limit the low frequency content of the sound.

Only criteria using LAMax limits can address the fluctuations in wind turbine noise that result in complaints. Setting the thresholds using the LAMax threshold allows the wind utility developer to select wind turbine manufacturers and models that use designs and operating controls that limit fluctuations in sound. Thus, a wind turbine designed so that the maximum sound levels are not more than 5 dBA LAMax above the Leq would be permitted to produce 40 Leq versus 35 Leq for wind turbines that produce fluctuations that exceed the Leq by 10 or more dBA.

Further, a sound limit based on not to exceed sound levels has been tested in court. In Tuscola Wind III, LLC v. Almer Charter Township, Case No. 17-CV-10497, U.S. Dist. Ct. E.D. Michigan, the Court rejected the argument by the wind energy project developer that a "shall not exceed" sound limit of 45 dBA could be interpreted as anything other than an "LMax" sound limit. The Court further rejected the argument that such a sound limit constituted unlawful "exclusionary zoning." Instead, the Court noted that the wind developer was free to lease more ground from the residents, construct smaller turbines, or construct fewer turbines. This decision verifies the right of municipalities to enact "shall not exceed" or "LMax" sound limits for wind turbines as part of a zoning ordinance.

APPLYING WHAT THESE STUDIES SHOW TO THE SHIAWASSEE PROPOSED REGULATIONS

Table 2 summarizes the comments in the documents on Shiawassee's proposed regulations. The first column identifies the regulation topic and section. The next two show the 2017 and 2018 wording proposed by the County Planning Director, the most recent being in response to the comments made earlier on the 2017 draft. The next column presents RWSC's most recent suggestions (Nolan Proposal Redline) and refer to the wording RWSC has suggested for the final regulation for each of the sections. The last three columns present the redline suggestions by the three developers as noted. Only Trade Wind Energy made direct suggestions to change the wording of the 2017 draft.

Table 2- Summary of Various proposals for thresholds and requirements

Section of Regulation	Shiawassee 1st Draft Proposal 8/14/17	Shiawassee 2nd Draft Proposal 3/20/2018	Nolan Proposal Redline with March 2018 Revisions	DTE Energy Proposal per DTE Blue Line Comments	Trade Wind Energy Proposal Per redline comments	Maple Rapids Proposal Per redline comments
Modeling and Pre-operational noise study (4.A.1)	ANSI S12.9 Part 3, ANSI S12.100 Other applicable ANSI standards	No changes	Add ANSI S12.62 (2012) Attenuation of sound during propagation outdoors to S12.9 Part 3 and S12.100.	Not addressed in Blue Line	Suggests adding S1.13, and S12.18 to S12.9 Part 3.	Not addressed in redline
Conducted by (4.A.1.)	"…acoustician acceptable to the County..."	Inserted "…qualified and certified…" Deleted **"…**acoustician acceptable to the County…"	Use language in 8/14/17 draft. The County should have oversight of the selected acoustician	Not addressed in Blue Line	Certified acoustical consultant (INCE)	Not addressed in redline
Noise levels (4.A. 3)	"...shall not exceed forty-five (45) dB(A) LAMax at the closest non-participating property line…."	"...shall not exceed fifty (50) dB(A) LAMax at any Non-Participating Parcel Boundary…"	No change to 8/14/17 language	Not addressed in Blue Line (RSG 45 dBA Leq)	NTE 45 dBA (LAMax) at NP structure NTE 55 dBA (LAMax) at NP P/L 10 minute Leq	Not addressed in redline
NTE means not to exceed NP means Non-Participating						

Beginning with the first row which addresses which standards should be used for models and measurements, Nolan's 2018 redline suggests adding the standard for modeling, ANSI S12.62 (2012) Attenuation of sound during propagation outdoors to the current wording requiring use of S12.9 Part 3 and S12.100. These standards cover the same topics as the S1.13, and S12.18 standards suggested by Trade Wind Energy. They would be redundant and, where there are differences, create potential conflict.

The second row addresses the issue of qualifications for acousticians. The 2018 draft of the proposed regulations inserted "…qualified and certified…" and deleted "…acoustician acceptable to the County…" which had been in the 2017 draft. The wording in the first draft is preferred. Certification does not establish expertise in wind turbine and community noise. That is a very limited sub-field of acoustics. Certified acousticians do not necessarily have the experience needed to effectively and impartially do work on wind turbine noise. This is a specialized topic where experience and lack of bias should be the deciding factor. It is not about certification; it is about qualifications. Nolan's suggestions are to retain the wording of the 2017 draft.

The third row addresses the criteria that should be used to regulate wind energy projects. Given the discussion in the sections above on sound characteristics, thresholds, annoyance and audibility,

thresholds that allow wind turbines within ½ mile present serious risks to public health. As shown in that discussion, thresholds of 45 dBA Leq should not be considered acceptable. In this context, Nolan's suggestion to change the 2018 Shiawassee draft language of 50 LAMax to the 45 LAMax of the 2017 draft is founded on the most current information available, including a study conducted by DTE's acoustical firm, RSG. A threshold of 45 LAMax is both reasonably protective, and does not preclude development of wind energy projects as stated in the Almer Township Court's decision.

ADDITIONAL COMMENTS

There are several statements made in the documents supplied by the three developers and their acousticians that warrant rebuttal.

1. In the letter of Dec. 12, 2017 from Mr. Duncan of RSG to DTE he makes the assertion that a 45 LAMax limit would be among the most stringent community noise regulations in the US. First, a limit should be based on what is protective, not what has been done in the past. Our limits and thresholds for pollution change as we learn more about how it impacts people. Second, there are many communities just in Michigan that have limits of 45 LAMax or less, generally in townships where the County has allowed much higher thresholds. It is not important that other regions have higher limits if those limits are not protective.

2. In the same letter, RSG claims that a limit of 40 LAMax would preclude development in the county. That is also not true. A limit of 40 LAMax would require that the developers select the quietest models and ones with blade and operating system designs that limit fluctuating sound levels. They could also make arrangements with adjacent land owners for noise easements.

3. In the same letter RSG claims that Mr. Nolan's recommendation for a dBC limit is not typically used for community noise and that dBC is used only for testing of impulsive sounds and wind turbines do not fall into that category. Both of these statements are incorrect. First, WHO has advocated the use of dBC criteria in community noise since the mid 1990s. They have numerous cautionary statements about the need for dBC measurements when the noise being regulated contains significant low frequency noise. As seen in the section on wind turbine sound characteristics, wind turbine infra and low frequency sound is much higher in sound pressure level than the mid and high frequencies which are regulated with dBA measurements. (See Figure 1 of attached Figures and related discussion above.) Further, RSG's acousticians have attended numerous conferences where presentations have demonstrated that wind turbine noise is dominated by its infra sound energy, including the most recent meeting in Dec. 2017 where Mr. Steven Cooper demonstrated that people could sense these sounds under laboratory conditions at sound levels below the thresholds of

audibility. To claim that infra and low frequency sound is not a primary characteristic of wind turbine sound emissions is incorrect and misleading. Second, while dBC may be useful in assessing impulsive sounds (typically blasting noise), it has a major role in measuring and limiting low frequency noise. To say that it is used only for impulsive sounds is again misleading and incorrect.

4. There is a comment in DTE's redline, page 4 of 11, Comment ED11, that states: "*If an LMax metric is used a higher limit of 55 to 60 dBA is more appropriate per World Health Organization guidelines and other community noise guidelines*." The World Health Organization Guidelines from 2009 state that sound levels outside a home that exceed 40 LAMax at night result in awakenings. They do not set any limit for an acceptable number of such events per night. There is no current WHO Guideline that accepts levels of 55 to 60 dBA as acceptable. This statement is incorrect and misleading.

CONCLUSION

New evidence shows that wind turbine noise causes High Annoyance and other adverse impacts to 10% or more of the people living in projects with separation distances of less than ½ mile and sound levels of 40 dBA Leq or less. Sleep studies show that 45 dBA Leq is not protective against sleep disturbance due to the low frequency and fluctuating nature of the sounds that penetrates into homes even at large separation distances. Shiawassee County Planning Commissioners should consider this new evidence and set the regulatory thresholds and methods of measurement accordingly. They should not repeat the mistakes other jurisdictions have made in the past.

The recommendations of RWSC reflected in Mr. Nolan's most recent redline and the representation of them in this statement support a threshold of 45 LAMax and 55 LCMax. The arguments to the contrary are either based on outdated research or statements that are incomplete and misleading.

Selecting a threshold that allows exposing 10% or more of the population to noise that poses such high levels of annoyance and risks of adverse health effects is a failure to protect the health, safety and welfare of the population.

The County Planning Commission should take these recommendations as the foundation for a regulation that is protective and based on current research and guidelines.

Sincerely,
E-Coustic Solutions LLC

Richard R. James

Attachments: A. Qualifications
B. Figures

Mr. James is the Owner and Principal Consultant for E-Coustic Solutions, LLC, of Okemos, Michigan. He has been a practicing acoustical engineer for over 40 years. He started his career as an acoustical engineer working for the Chevrolet Division of General Motors Corporation in the early 1970s. His clients include many large manufacturing firms, such as, General Motors, Ford, Goodyear Tire & Rubber, and others who have manufacturing facilities where community noise and worker noise exposure occur. In addition, he has worked for many small companies and private individuals. He was actively involved with the Institute of Noise Control Engineers (INCE) since its formation in the early 1970's. He was a full Member from early in the 1990's through 2017.

His academic credentials include a degree in Mechanical Engineering (BME) from General Motors Institute, Flint Michigan (now Kettering Institute). He has been an adjunct Instructor to the Speech and Communication Science Department at Michigan State University from 1985 to 2013 and an adjunct Professor for the Department of Communication Disorders at Central Michigan University from 2012 through 2017. In addition, Mr. James served on the Applied Physics Advisory Board of Kettering Institute from 1997 to 2007.

Specific to wind turbine noise, he has worked for clients in over 60 different communities.

He has provided written and oral testimony in approximately 30 of those cases. He has also authored or co-authored four papers covering wind turbine noise topics including:

- Criteria for wind turbine projects necessary to protect public health (2008),
- Demonstrating that wind turbine sound immissions are predominantly comprised of infra and low frequency sound (2011), and
- A peer reviewed historical review of other types of low frequency noise sources with similar sound emission characteristics, such as large HVAC systems (fans) which caused noise induced Sick Building Syndrome and other noise sources that have known adverse health effects on people exposed to their sound. (2012).
- A peer reviewed literature review of research spanning 40 years showing wind turbines cause risks of adverse health effects from both audible and inaudible sound emissions (2016).

He has been qualified as an expert in acoustics for hearings and court proceedings in several countries. Examples of recent qualifications are:

Jurisdiction	Before	Qualified as:
Ontario, CA (January 2014)	Ministry of Environment (MOE) and Environmental Review Tribunal (ERT)	Qualified to provide evidence on matters related to acoustics and noise control engineering and wind turbines
Alberta, CA (Dec. 2013)	Alberta Utilities Commission (AUC)	An acoustical engineer and acoustician with expertise in the field of sound including noise, low frequency noise, sounds emitted from industrial wind turbines and human response to noise.
Michigan, US	Michigan Circuit Court	1. acoustician with expertise in measurement of wind turbine noise and its effects on people. (Dec. 2013) 2. acoustician qualified to opine that the plaintiff's symptoms were caused by the defendant's wind turbines. After special Daubert Hearing (Dec. 2013)

Figures

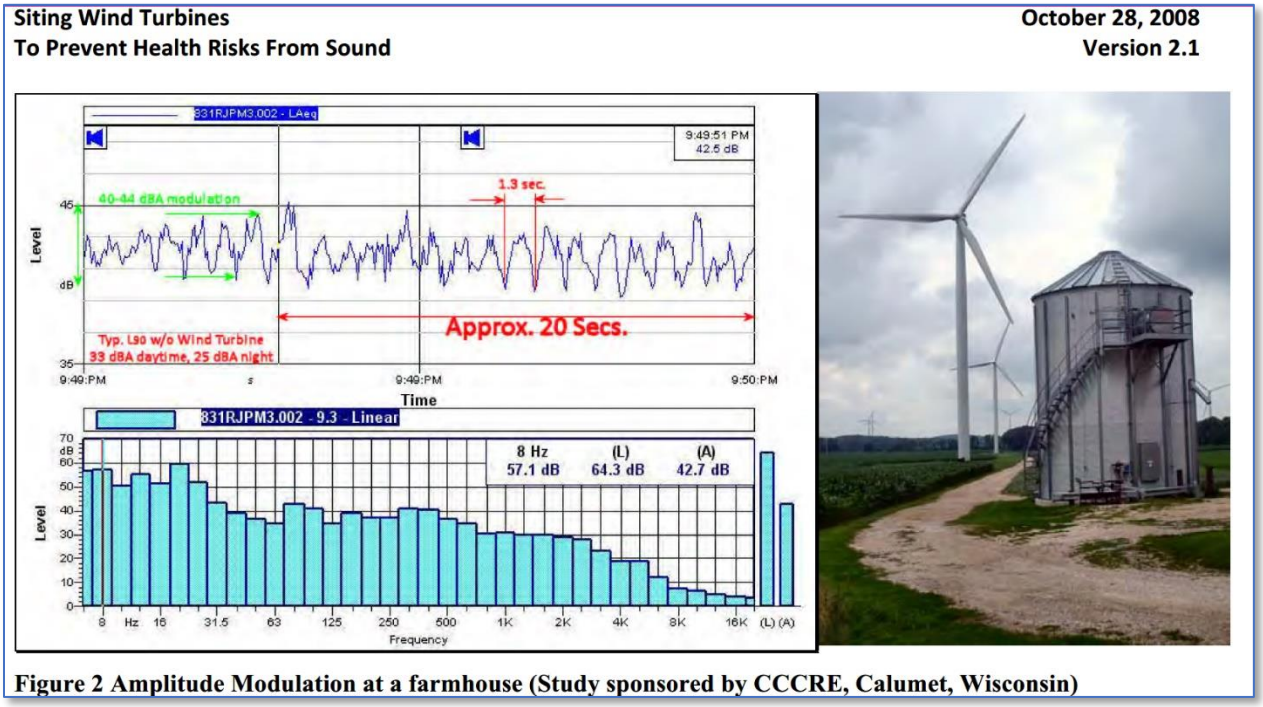


Figure 1-Example of Fluctuating Wind Turbine Sound-Modulation depth of 8 dBA over 30 seconds

Source: Kamperman/James: "The 'How To' Guide to Siting Wind Turbines to Prevent Health Risks from Sound (2008)

Table 4

Promising Practices for Nighttime Sound Pressure Levels by Land Use Type

Land Use	**Sound Pressure Level, dB(A) Nighttime Limits**
Industrial	70
Commercial	50
Villages, mixed usage	45
Sparsely populated areas, 8 m/s wind*	44
Sparsely populated areas, 6 m/s wind*	42
Residential areas, 8 m/s wind*	39
Residential areas, 6 m/s wind*	37

**measured at 10 m above ground, outside of residence or location of concern*

Figure 2-Mass. Expert Panel Report Recommends Criteria of 40 dBA Leq or lower for residential areas (2012)

Source: **Wind Turbine Health Impact Study: Report of Independent Expert Panel, January 2012, Prepared for: Massachusetts Department of Environmental Protection, Massachusetts Department of Public Health**

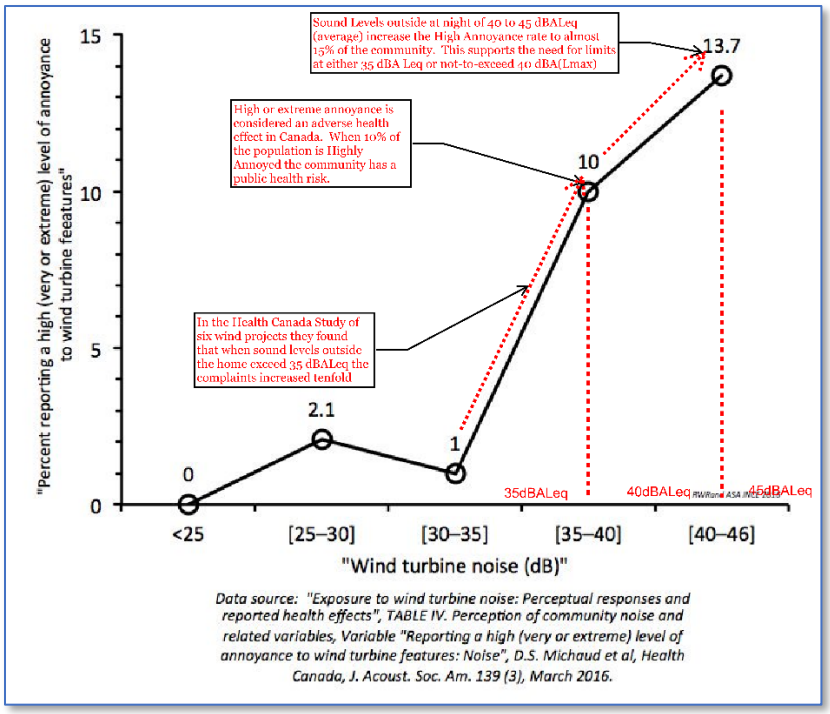


Figure 3 Health Canada Study of Wind Turbines and Annoyance

(Source: Michaud D, et al, "Exposure to wind turbine noise: Perceptual responses and reported Health Effects," March 2016, JASA, A study conducted for Health Canada

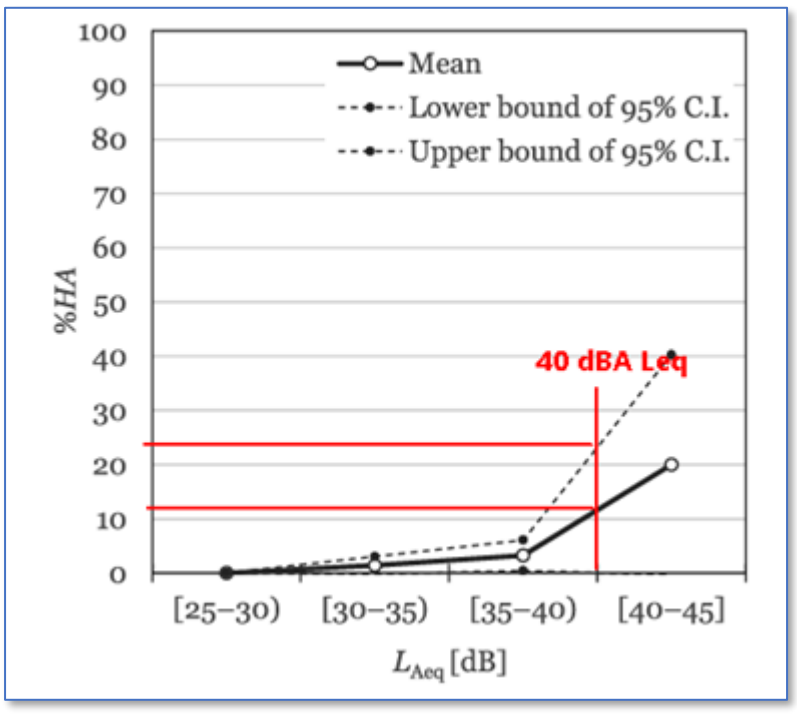
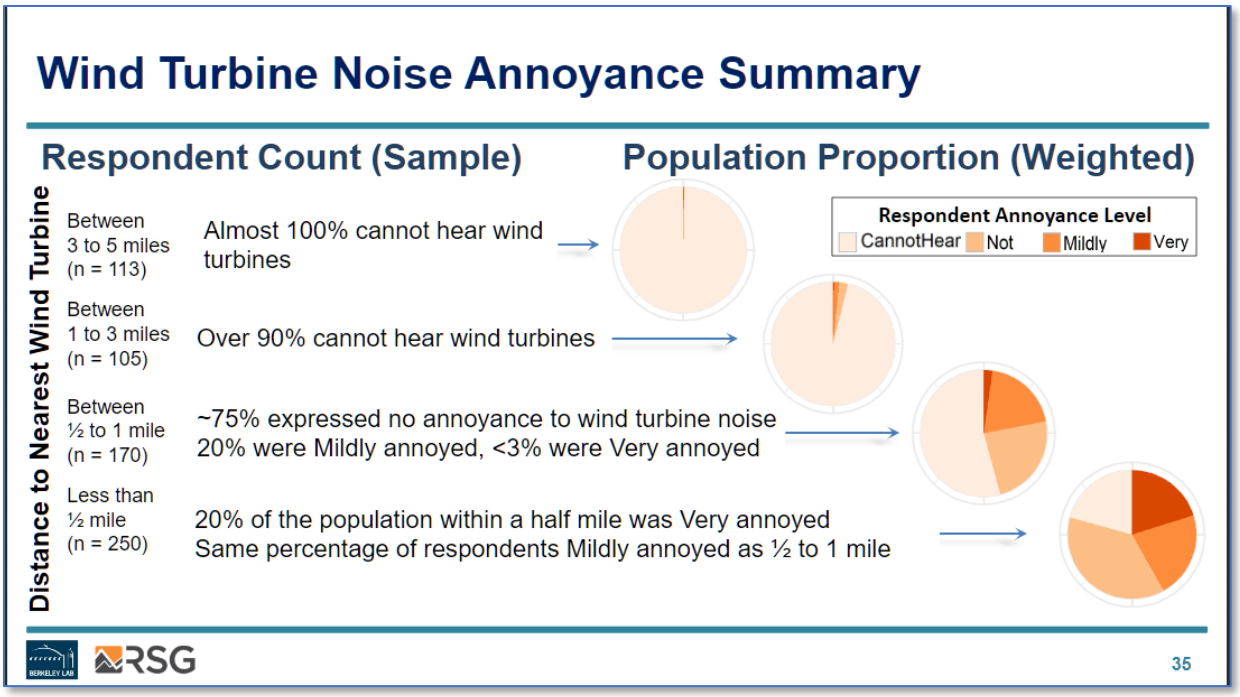


FIG. 1. The exposure–response relationship for indoor noise annoyance and the related confidence interval (N ¼ 398) in four sound level categories. Laeq corresponds to the predicted equivalent A-weighted sound level of wind turbine noise outdoors during maximum sound emission from the wind power area. %HA is the percentage of highly annoyed participants by wind turbine noise indoors according to definition 1 of Sec. II F. The expected uncertainty of Laeq is negligible based on the results of Table III

Figure 4 Annoyance Study of Wind Turbines in EU countries where limits are 40 dBA Leq or lower

Source: Hongisto V, Oliva D, Keranen J, "Indoor noise annoyance due to 3–5 megawatt wind turbines—An exposure–response relationship," Oct. 2017, JASA



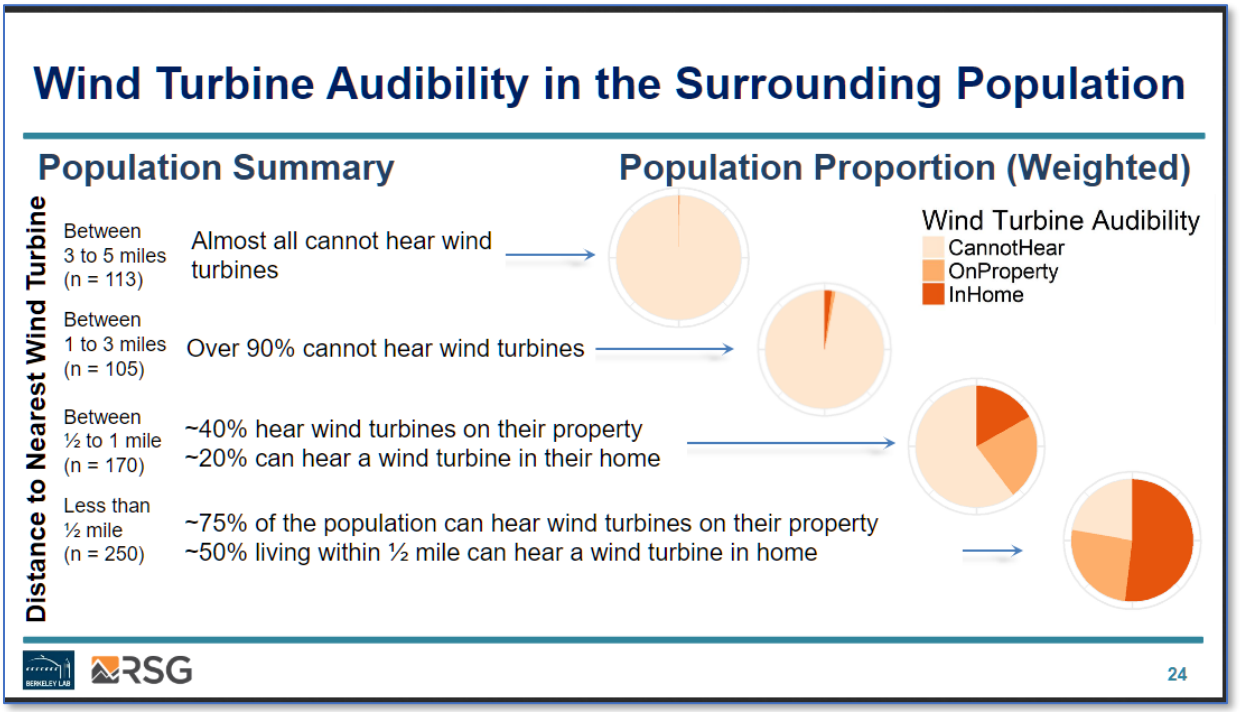


Figure 5 Slides reporting Audibility and Annoyance to Wind Turbine Sounds in the US

Source: Haac R, Kaliski K, Landis M, (RSG), Hoen B (Lawrence Berkeley National Laboratory), "Predicting Audibility of and Annoyance to Wind Power Project Sounds Using Modeled Sound," For Wind Energy Technologies Office of USDOE, February 27, 2018 Webinar

Section 17. Wind Energy Conversion Systems

A. Overview

This Section provides the regulatory framework for Wind Energy Conversion System (WECS) Facilities. The regulations within this Section are in addition to relevant development standards and regulations in other parts of this Zoning Resolution and apply to all unincorporated areas of Sweetwater County. Unless otherwise provided, the requirements of this Section are in addition to the zone district requirements set forth in the Sweetwater County Zoning Resolution.

Applications for a Commercial WECS Facility Permit require a public hearing before the Board.

B. Intent and Purpose

The intent of these regulations is to: provide for public safety, prevent hazards from the construction of commercial and non-commercial WECS Facilities, preserve environmental, historical and cultural resources, maintain the unique custom and culture of Sweetwater County, and to sustain the diverse existing uses of the land. In addition, the purpose is to consider and require carefully planned and compatible WECS Facilities in Sweetwater County.

C. Commercial WECS Facility Permit Application Requirements

No person shall commence or construct a Commercial WECS Facility without obtaining the required permit from the Board.

Non-Commercial WECS Facilities and MET towers will be administered in accordance with the Non-Commercial WECS Facility requirements of these regulations.

Commercial WECS Facilities shall be administered as provided below:

1) A Commercial WECS Facility Permit Application including all WECS Project Phases shall be accompanied with the following information:

   a) Fee

      The Applicant shall submit fees as required.

   b) Copies

      The Application submittal to the Department shall be accompanied by two memory sticks with digital copies of a complete Commercial WECS Facility Permit Application.

   c) Certifications

      All certifications, affidavits, consents and acknowledgements required of the Applicant by these Regulations must meet the approval of the Sweetwater County Attorney's Office.

   d) Owner Consent

Letters from all surface property owners upon which the WECS Facility will be located or other legal documentation (memorandum of lease, etc.) which demonstrates consent of owners for the WECS Facility.

e) Contact Information

The names, addresses, telephone numbers and email addresses of the applicants, developers, operators and owners of land within the WECS Facility.

f) Public Utility Information

Documentation that the proposed WECS Facility is owned or operated by a Public Utility and subject to the requirements of the Public Service Commission, if applicable.

g) Adjacent Landowners Contact Information

The names, addresses, telephone numbers and email addresses of all adjacent surface property owners within 2,640 feet of the WECS Facility Boundary.

h) General Scope of WECS Facility

Relevant information on the project including general location of the project, timeframe for construction including the schedule for phasing, project life, markets for the electricity produced and status of power purchase agreement.

Pr

i) Summary of the WECS Facility

Provide a description of the WECS Facility including its total nameplate generating capacity and a nameplate capacity of each turbine, the equipment manufacturers, types of wind generation devices, complete component list of WECS, number of Wind Turbines, the maximum wind turbine height, maximum blade tip speed, the maximum diameter of the rotor, and the minimum distance between the ground and the rotor.

j) WECS Facility Site Plan

A WECS Facility site plan shall include the following:

(1) Drawings, prepared by a Professional Engineer and Surveyor Licensed in the State of Wyoming, prepared to a suitable scale on 24" x 36" sheets and two memory sticks with digital copies, depicting the layout of the following:

(a) All existing structures, right of ways, and above and below ground facilities and utilities within the WECS Facility Area and within 2,640 feet of the proposed WECS Facility Boundary. If access is not attainable outside the WECS Facility Boundary, the applicant shall propose to the Board an alternative plan that addresses any impact the project causes to any existing structures above and below ground and R.O.W.'s outside of the WECS Facility Boundary.

(b) All proposed WECS Facility components and structures, right-of-ways, and above and below ground facilities within the WECS Facility Area and within 2,640 feet of the WECS Facility Boundary including, but not limited to, the following:

a. WECS Facility boundary lines and property lines prepared by a Wyoming Licensed Surveyor.

b. Topographic lines showing the existing topography of the project and the surrounding area (USGS or other topographic maps may be utilized).

c. All existing and proposed public and private access roads and turnout locations including dimensions.

d. Utilities, pipelines and similar facilities.

e. Proposed location of each WECS Tower.

f. Project reference number for each WECS Tower.

g. Anchor bases and all supports.

h. Layout, use and dimension of all structures and ancillary equipment within the WECS Facility Area, within 2,640 feet of the WECS Facility Boundary and within the geographical boundaries of any applicable setback. Identify all setback distances for all structures and ancillary equipment.

i. Fencing detail.

j. A complete electrical layout of the entire WECS Facility Project including substation locations, transmission, collector and gathering lines and other ancillary facility components.

k. Map of dominant wind characteristics. A non-proprietary map showing wind characteristics and dominant wind direction, which is the direction from which 50% or more of the energy contained in the wind flows.

k) Property Description and Vicinity Map

Property description which includes a general vicinity map of the WECS Facility and a legal description of the WECS Facility Boundary (i.e. NW1/4, SE1/4, Sec 2, T42N, R6W), and acreage within this Boundary.

l) Construction Site Plan

A construction site plan and narrative showing and explaining all components necessary

during the project construction phase including, but not limited to, batch plants, stock piles, office trailers, lay down yards, water storage, health and sanitation facilities. This site plan shall be drawn to a suitable scale on 24" x 36" sheets and submitted in digital format.

m) Environmental Report and NEPA Compliance

All applicants are required to prepare and submit to the County an Environmental Report. Said Environmental Report must satisfy all the requirements of this section. For those applicants who have complied with the requirements of a published Draft Environmental Impact Statement (Draft EIS) pursuant to the National Environmental Policy Act (NEPA), those applicants may request a waiver, from the Board, of some or all of the requirements of the Environmental Report. If no Draft EIS has been prepared pursuant to NEPA, the Board may grant a waiver or partial waiver if the applicant submits an Industrial Siting Application pursuant to the requirements of the Industrial Siting Council. No waiver shall be provided unless the applicant can demonstrate that the contents of the Draft EIS or the Industrial Siting Application, if applicable, substantially match, in whole or in part, the requirements of the Environmental Report herein. These Reports must be prepared by Qualified Professionals and submitted with the Commercial WECS Facility Permit Application, and include the following:

All applicants shall present an Environmental Report which contains the following specific report requirements; however, certain requirements and standards will be required of all applicants as specifically designated in these regulations.

1. Wildlife and Habitat

A report that includes a survey of all of the wildlife and habitat within the WECS Facility Area and in any Biologically Significant area surrounding the WECS Facility Area where legal access is available and as determined by the Wyoming Game and Fish Department or governing federal agency. Where legal access is not obtainable, the applicant shall advise the Department or the Board. Wildlife mitigation and monitoring plan shall be prepared if recommended by the Wyoming Game and Fish and/or governing federal agency.

Said report shall address:

a. All Special Status Species

b. The presence of elk, mule deer, antelope and other mammal populations.

c. All avian species present, including raptors and other migratory birds. Said report shall include the important habitat for those avian species, such as nesting, stop-over sites, roost sites, and hunting perches.

d. All bats, both resident and migratory. Said report shall include surveys for hibernacula, maternity roosts and colonial roost sites.

e. All wildlife crucial ranges including winter ranges, parturition areas, nesting areas, fish spawning areas, migration corridors and similar areas that are critical to wildlife.

f. All Greater Sage Grouse Core Areas, leks and winter concentration areas.

g. Wildlife Studies and Surveys shall be performed in conformance with the protocols and recommendations of the Wyoming Game and Fish Department and governing federal agencies.

h. A Wildlife Impact Mitigation Plan, if recommended or required by Wyoming Game and Fish Department and governing federal agencies, prepared in conformance with the protocols and recommendations of the Wyoming Game and Fish Department and governing federal agencies.

i. A Wildlife Monitoring Plan, if recommended or required by Wyoming Game and Fish Department and governing federal agencies to monitor the effects of the developed WECS Facility on wildlife, prepared in conformance with the protocols and recommendations of the Wyoming Game and Fish Department and governing federal agencies.

j. An inventory of all flora and the anticipated impacts to the flora within the WECS Facility Area and a flora mitigation plan prepared by a Qualified Professional, if determined necessary by the appropriate agency.

k. A report, prepared by a Wyoming Licensed Professional Engineer, detailing produced water quality, supply, demand, disposal of water during the construction and maintenance of the WECS Facility, and the Project's effect on water quality and supply within 2,640 feet of the WECS Facility. This report shall include a water impact mitigation plan, if the report identifies significant adverse impacts.

l. An inventory of wetlands and riparian areas and any anticipated impacts to these areas within the WECS Facility Area, and an appropriate mitigation plan prepared by a Qualified Professional, if determined necessary by the appropriate agency.

2. Historical, Cultural and Archaeological Resources

The applicant shall coordinate with appropriate agencies for matters concerning cultural resources studies (archaeological and historic sites) and any other relevant federal, state and local issues. This information shall be provided with the application.

3. WECS Facility

The WECS Facility requirements shall include a report on the following including any necessary mitigation measures:

a. The applicant shall provide a report describing the impact of the proposed WECS with the application on the adjacent community and residents. It shall describe in detail all noise studies/models and must demonstrate compliance with all ANSI/ISO standards for outdoor measurements and model predictions. Where such standards/protocols include confidence limits or limitations of use the report shall present them and provide an explanation of how they were addressed. Applicable ANSI Standards include: S12.9 "Quantities and Procedures for Description and Measurement of Environmental Sound" Part 4 "Noise Assessment and Prediction of Long-term Community Response" and ISO 9613-2 "Acoustics-Attenuation of sound during propagation outdoors, Part 2, "General Method of Calculation."

The computer model developed to estimate sound propagation from the WECS into the community shall be constructed to represent the sound immissions at the receiving properties for the predictable worst case conditions for sound emissions and propagation including that of a stable nighttime atmosphere with high levels of wind shear and turbulence above the temperature inversion boundary.

Models shall be constructed using octave band sound power levels covering the range of 31.5 to 4,000 Hz minimum. Predictions shall address all parts of the community where sound immission levels may exceed 30 dBA and 40 dBC.

All measurements, models, and reports shall be produced and certified by a qualified acoustical consultant with Full Member status with the Institute of Noise Control Engineering (INCE) and include:

i. A description and map of the project's sound producing features, modeled in dB(A) and dB(C), and the basis for the expectation.

ii. A description and map of the existing land uses and structures including any residences, hospitals, libraries, schools, places of worship, and parks within one and one-quarter miles of the exterior boundary of the proposed WECS. Said description shall include the location of the structure/land use, distances from the source of the sound or WECS and background (as defined in S12.9, Part 1 for "residual" noise) decibel readings (including appropriate documentation per ANSI standards for reporting, keyed to the date and time when measurements are taken) for each identified land use and structure described and mapped.

iii. A description of the project's proposed sound control features shall be described in detail, including specific measures to minimize noise impacts to structures and land uses identified in the preceding item. Information about potential post construction mitigation options, such as operation in Noise Reduction Operating (NRO) modes shall be described. If there are no post construction

mitigation methods available a statement to that effect shall be included along with reasons supporting that statement.

iv. The report shall address the potential for any and all adverse impacts from wind turbine sound emissions on the community and its residents located within one and one-quarter miles from the boundary of the WECS.

v. The report shall provide sufficient detail to permit complete peer review and include the information required in ANSI S12.18 "Procedures for Outdoor Measurement of Sound Pressure Levels" Section 9, Reporting.

b. The effect on Areas of Critical Environmental Concern, County and State Parks, Wilderness Study Areas, lands with wilderness characteristics, Historical Areas and Trails, and other similar areas.

c. The Applicant(s) shall provide certification and evidence that there will be no electromagnetic interference, caused by the WECS Facility, on any emergency and non-emergency telecommunication providers within Sweetwater County.

d. All reasonable public safety concerns as to the potential hazards to properties, public roadways, communities and subdivisions that may be adjacent to, or within five miles of, the WECS Facility Boundary.

e. Public and private aviation and airports/airstrips.

f. Potential hazards from ice throw.

g. Impact of Shadow Flicker on residences and occupied structures from any WECS Facility and estimated duration of the Shadow Flicker in hours per year.

h. Light impact on neighboring properties and communities

i. Potential hazards of Blade Glint.

j. Identify fire hazards and mitigation measures.

k. Potential hazards from collapse of damaged turbines or other system components caused by serve storms or other circumstances.

4. Social and Economic

The social and economic reporting requirements shall include the following and any mitigation measures to address adverse social and economic impacts:

a. The estimated amount of property, sales, and other taxes to be generated by the project in Sweetwater County and outside of Sweetwater County.

b. Estimated local expenditures of construction materials in Sweetwater County.

c. The estimated number of construction jobs and estimated construction payroll. Estimated number of local construction job opportunities.

d. Estimate the construction workforce spending in Sweetwater County.

e. The estimated number of federal, state and local government jobs effected and added as a result of the WECS project.

f. The estimated number of permanent jobs and estimated continuing payroll.

g. The estimated demographic characteristics of the construction and permanent work force including workers, family members and any adverse impacts on local infrastructure i.e., schools, housing, EMS, Local and State Government, law enforcement, health, etc.

h. The estimated costs of the WECS Facility's impacts on roads or other public infrastructure.

i. A mitigation plan to address identified significant adverse socioeconomic impacts.

n. Drainage, Erosion, Dust Control, Grading and Vegetation Removal Plan

A drainage, erosion, dust control, grading and vegetation removal plan for each phase of the project shall be prepared by a Wyoming Licensed Professional Engineer, drawn to scale and include, but not be limited to, the following:

1. Drainage calculations based on a 25-year storm event unless the location, terrain and topography dictate a higher amount.

2. Existing and proposed contours

3. Historic and produced flows

4. Existing wetlands

5. Established floodways

6. Existing and proposed roadways

7. Water management structures

8. Drainage through the WECS Facility area

9. Effects on downstream and upstream properties

10. Erosion mitigation and runoff control

11. Dust control

12. A mitigation plan that addresses the risks of erosion and flooding, including flooding on all adjacent, upstream and downstream properties.

o. Waste Management Plan

A waste management plan that includes an inventory of estimated solid wastes to be generated and a proposed disposal program for the construction, operation and eventual decommissioning of the proposed WECS Facility.

p. Transportation Plan

A transportation plan prepared in accordance with these regulations.

q. Emergency Management Plan

Applicant(s) shall submit a written emergency management plan for review and comment to the appropriate fire department or district, County Emergency Management Coordinator and the County Sheriff. If the WECS Facility extends into another county, the emergency management plan shall address multi-county coordination of emergency notices and use of emergency services and the plan shall be commented upon by officials of the other county. If the WECS Facility permit is granted, the plan shall be supplemented and revised following construction of the WECS Facility and prior to its operation, if there are any variations in the project construction which would materially impact the original emergency management plan.

r. Reclamation and Decommissioning Plan

Provide a site and facility reclamation and decommissioning plan in accordance with these regulations and Wyoming Statute 18-5-503(a)(x). In addition, the applicant shall certify that any owner who is not the applicant has been notified of the requirements of the reclamation and decommissioning plan.

s. Certification to Provide As-Built Drawings

A certification that as-built drawings will be provided in compliance with Wyoming Statute 18-5-503(a)(viii).

t. Certification of Compliance with Zoning and Land Use Regulations

Certify that the proposed WECS Facility will comply with the Sweetwater County Zoning Resolution and all other applicable Sweetwater County Development Codes. Additionally, if explosives are to be stored on site, a Conditional Use Permit is required.

u. Certification of Compliance with Wyoming Statutes

Certify that the proposed WECS Facility will comply with all the standards required by Wyoming Statute 18-5-504 if Sweetwater County has not adopted more stringent standards. If Sweetwater County has adopted more stringent standards, the certification requirement shall apply to the more stringent standards.

v. Certification of Compliance with Noise Standards

Certification that the WECS project facility will not exceed any of the criteria herein at the project boundary line and at the nearest property line of land not owned by or leased to the WECS owner/operator.

w. Coordination with Local, State and Federal Agencies

A list of all local, state and federal agencies requiring approval and the projected timeline for obtaining approval from these agencies. If approved, provide a copy of such approval, including all required studies, reports and certifications. When a WECS Facility requires a Federal National Environmental Policy Act (NEPA) document and approval, the applicant shall submit with its application for a WECS Facility Permit a completed, published electronic Draft NEPA document required by the governing federal agency for the proposed WECS Facility.

x. Viewshed Impact Analysis and Proposed Mitigation Measures Report

Provide an accurate visual simulation of the WECS Facility structures and components by showing a minimum of 25 key vantage points providing the worst case scenario, in coordination with the Department, that are representative of the diverse public usage of the land including recreational, residential, and business. These vantage points shall consider a 360 degree view of the project site. The applicant shall provide a report including the following:

1. Analysis of the viewshed impacts and mitigation program for all key vantage points; and,

2. Visual rendering of the proposed WECS Towers, blades and other WECS Facility structures and facilities with color scheme represented on a relatively clear day.

y. Certification of Advertising and Promotional Lettering

Certify that there shall be no advertising or promotional lettering on any WECS Facility structure, WECS Tower, turbine, nacelle or blade beyond the manufacturer's or applicant's logo on the nacelle of the turbine as approved by Sweetwater County.

z. Publication of Notice in Newspaper

Certify that notice of the Commercial WECS Facility Permit Application will be published in the official newspaper of Sweetwater County and the official newspapers of all counties in which the proposed WECS Facility is located. This notice shall be published in all official

newspapers at least twice in two different weeks, at least 20 days prior to the Board's public hearing on the application. The notice shall include a brief summary of the WECS Facility, invite the public to submit comments and identify the time and date of said hearing.

aa. Required Letters and/or Reports

Provide letters and/or reports addressing issues or concerns from the following agencies related to the WECS Facility Area and surrounding region as determined by the Wyoming Game and Fish, Wyoming State Historic Preservation Office, Sweetwater County Conservation District, Wyoming Department of Environmental Quality and Federal Aviation Administration:

1. Wyoming Game and Fish

   A letter or report from the Wyoming Game and Fish addressing any environmental issues concerning endangered or threatened species, wildlife migrations or protected populations.

2. Wyoming State Historic Preservation Office

   A letter or report from the Wyoming State Historic Preservation Office addressing any historic, cultural or archaeological resources.

3. Sweetwater County Conservation District

   A letter or report from the Sweetwater County Conservation District addressing soil conditions and erosion within the WECS Facility Area.

4. Wyoming Department of Environmental Quality

   A letter or report from the Wyoming Department of Environmental Quality addressing any land and water quality issues.

5. FAA and Airport Notification and Letters of Approval: Provide letters from the FAA and the owners of the potentially affected public and/or private airports or airstrips demonstrating that the affected entities have been notified of the pending WECS Facility.

bb. Notice of Mineral Rights

Applicant(s) shall certify that notice has been provided to the record owners and claimants of mineral rights located on or under the lands where the proposed facility will be constructed. Such notice shall contain the location of proposed WECS towers and underground wiring and may include notice by publication. The certification of notice shall be provided with the application. The notice shall comply with all standards and requirements adopted by the Industrial Siting Council.

cc. Notice Requirements

An affidavit by the Applicant(s) shall be submitted which certifies that the Applicant has undertaken reasonable efforts to provide written notice to all owners of land within one mile of the property line of the proposed WECS Facility and to all cities and towns located within 20 miles of the WECS Facility. Notice shall include a general description of the project including its location, projected number of turbines and the likely routes of ingress and egress. The affidavit shall attest that notice was mailed to those owners of record on file at the Sweetwater County Clerk's Office.

D. WECS Facility Compliance Standards

The following standards are to be achieved by each Commercial WECS Facility whether it has been analyzed by NEPA or not. The final decision on whether or not a particular standard is achieved by a Commercial WECS Facility shall be made by the Board. The project shall also be installed as approved by the Board.

1. WECS Facility Safety

WECS Facilities shall be developed in a manner that utilizes sound engineering practices and considers public safety in regard to the potential hazards that may be created to adjacent properties, public infrastructure, communities, aviation, etc. The following lists public safety matters that shall be addressed and implemented in the development of the WECS Facility.

a. Design Safety Certification

WECS Facilities shall conform to applicable industry standards, including those of the American National Standards Institute ("ANSI") and the Institute of Electrical and Electronics Engineers ("IEEE") and the National Electrical Code (NEC). Concurrently with permits for construction, the Applicant(s) shall submit certificates of design compliance that equipment manufacturers have obtained from Underwriters Laboratories ("UL"), Det Norske Veritas ("DNV"), Germanischer Lloyd Wind Energie ("GL"), or an equivalent third party.

b. Construction Standards

All WECS Facility structures and components shall conform to the most recent edition of the International Building, Plumbing, Fire, Mechanical and Fuel Code, and the National Electrical Code. Before the construction permit is issued, the Applicant shall provide drawings stamped by a Wyoming Licensed Professional Engineer certifying that all structures comply with the applicable code standard.

c. Airport and Aircraft Safety

WECS Facilities shall comply with applicable FAA regulations and comply with conditions regarding WECS Facility installation established by affected airports. If approved by the FAA, all WECS Facilities shall implement a FAA approved Aircraft Visual Warning System (AVWS) that allows for the use of aircraft warning lights to be minimized.

d. Retro-fitting AVWS Systems

If a WECS Facility is approved without having an AVWS system installed, the Project Owner or Operator shall install an AVWS system within one year of when AVWS systems are approved by the FAA and made available.

e. Marking Guy Wires and Anchor Points

For projects that are placed on land with public access, visible, reflective, colored objects, such as flags, reflectors, or tape shall be placed on the anchor points of guy wires and along the guy wires up to a height of 15 feet from the ground. All guy wires must comply with the Bird Diverter Standards stated in these regulations.

f. Exterior Climb Prevention

All Wind Generation Devices and other similar WECS Facility structures must be un-climbable by design or protected by anti-climbing devices.

g. Potable Water and Sanitary Sewer

All permanent and occupied WECS Facility management and office buildings must have approved centralized potable water and sanitary sewer systems. This approval shall be obtained from the Sweetwater County Health Department or the Wyoming Department of Environmental Quality.

h. Impact on Regional Water Supplies

The WECS Facility shall not adversely affect ground water resources, in particular the ground water supplies of nearby subdivisions or other developments.

i. Fire Prevention Measures

1. All structures shall comply with the most recent edition of the International Fire Code adopted by Sweetwater County.

2. Appropriate fire protection measures as required by the Sweetwater County Code Enforcement Specialist shall be implemented.

3. All roads servicing primary structures or occupied accessory buildings shall be constructed to the standards of the most recently adopted edition of the International Fire Code.

j. As–Built Drawings

The Developer shall provide as-built drawings showing the location of all structures. All structures shall be constructed no greater than 50 feet from the locations identified with the permit application and must meet all setback requirements.

2. Visual Impacts

WECS Facilities shall not adversely impact scenic areas that are considered important by federal,

state and local governments. Important scenic areas include visual corridors, viewsheds, historic landscapes, scenic byways and scenic overlays. In determining the important scenic areas for Sweetwater County, and any adverse visual impacts caused by the proposed WECS Facility, the Board shall take into account the federal, state and local important scenic areas, the WECS visual simulations and public comment. The Board may require specific design standards or restrictions that may mitigate or prohibit the degree to which the WECS Facility may impact those important scenic areas such as structure color, building height, greater setback distances and lighting.

a. Visual Simulation Standards

The Applicant shall employ representative sampling to achieve a fair and accurate result regarding the visual impacts of the proposed WECS Facility to residents of Sweetwater County. A minimum of 25 key vantage points providing the worst case scenario, in coordination with the Department, that are representative of the diverse public usage of the land including recreational, residential, and business.

b. Growth Management Area

Commercial WECS Facilities shall not be located within the identified Growth Management Area.

c. WECS Facility Color

When not conflicting with colors required by the Federal Aviation Administration or other federal agencies, Wind Generation Devices or WECS and other WECS Facility structures shall be painted a non-reflective and unobtrusive color that blends with the landscape and is accepted by the Board. The color selected shall be compatible with the natural visual character of the area.

d. Significant Shadow Flicker

WECS Facilities shall be designed so that there is no Significant Shadow Flicker at an adjacent property unless waived in writing and recorded against the property by the landowner in the Sweetwater County Clerk's office.

e. Visibility, Screening and Buffering

WECS Facility structures shall be located to make maximum use of existing terrain, vegetation and structures for the purposes of maintaining the viewshed.

f. Light Pollution

WECS Facilities, including buildings and structures, shall utilize International Dark-Sky Association compliant fixtures or an approved equal unless subject to FAA regulations.

g. Screening of Outdoor Storage

Except during construction, re-construction or decommissioning, outdoor storage is not

permitted within the project boundary except at locations that are screened in accordance with the regulations of the Sweetwater County Zoning Resolution.

h. Buried Collector and Gathering Lines

Intra-project power lines having a voltage of 34,500 volts or less shall be buried unless the applicant can sufficiently demonstrate that burying the lines will violate other guidelines, standards or applicable law.

i. Signage

There shall be no advertising or promotional lettering of any type allowed on any WECS Facility structures or Wind Generation Devices beyond the manufacturer's or the applicant's logo on the nacelle of the turbine.

3. Natural and Biological Resources

a. Wildlife Critical Areas

WECS Facilities shall not be located in areas that would result in significant impact to wildlife, wildlife habitat, or crucial wildlife ranges as determined by the Wyoming Game and Fish and/or the governing federal agency. Wildlife critical areas include, but are not limited to, crucial winter ranges, parturition areas, nesting areas, spawning areas, riparian areas and migration corridors.

b. Lands with Special Characteristics

WECS Facilities shall not be located in Wilderness Study Areas, Lands with Wilderness Characteristics, Areas of Environmental Concern, federal, state or county parks, National Recreation Areas, historic trails or special management areas and the Sweetwater County Growth Management Area.

c. MET Towers, WECS Facility Components and Avian Protection

Developers shall use MET Towers and WECS Facility components with designs that provide for the best prevention of injuries to avian predators and other avian species. For the purposes of avoiding bird collisions and to eliminate the need for MET Tower conversion during the WECS Facility construction phase, MET Towers shall comply with the following standards:

1. Permanent MET Towers

Monopole, non-lattice, non-guyed towers are required on Permanent MET Towers. The State of Wyoming requires that the owner or lessee of a MET Tower meeting established criteria must enter data into the Wyoming Department of Transportation MET Tower Database for the MET Tower. For MET Towers meeting the established criteria, the State of Wyoming also requires that a MET Tower structure be made visible so that it is recognizable in clear air during daylight hours from a distance of at least 2,000 feet. Structures can be made visible by lighting, marking,

painting, flagging, or otherwise constructing the tower in a manner that makes the tower visible from at least 2,000 feet.

2. Temporary MET Towers

Where guyed Temporary MET Towers are installed, the following stipulations apply:

a. The State of Wyoming requires that the owner or lessee of a MET Tower meeting established criteria must enter data into the Wyoming Department of Transportation MET Tower Database for the MET Tower. For MET Towers meeting the established criteria, the State of Wyoming also requires that a MET Tower structure be made visible so that it is recognizable in clear air during daylight hours from a distance of at least 2,000 feet. Structures can be made visible by lighting, marking, painting, flagging, or otherwise constructing the tower in a manner that makes the tower visible from at least 2,000 feet.

b. Bird diverters are required to be installed on guy wires.

c. Bird diverters shall display the following characteristics:

i. Movement in at least a 5 mile per hour wind and able to withstand winds above 20 miles per hour.

ii. Reflective in sunlight.

iii. 10 hours of luminescence at night.

iv. Incorporate UV reflection for lowlight conditions.

v. At least 18–square inches per single diverter design.

d. Term of Temporary MET Towers

Not to exceed three years with an option of one renewal not to exceed three years. If an applicant has an obligation from a state or federal agency to report bird fatalities caused by MET Towers, the applicant shall provide a copy of said report to the Board for each period in which the report is prepared. The Board may use this information in reviewing any application for renewal.

d. Greater Sage Grouse Core Areas

No WECS Facility shall be located within Greater Sage Grouse Core Areas as defined by Governor Order 2011-5 or as amended.

e. Avian Protection

Whether or not the proposed WECS Facility is on public or private lands, Developers,

Operators and Project Owners of WECS Facilities shall comply with all governing federal or state regulations regarding protection of avian species

f. Construction and Access during Wildlife Use

The Developer shall only perform WECS Facility construction activities within wildlife crucial ranges or migration corridors as recommended by the Wyoming Game and Fish or authorized by the applicable governing agency. Portions of the WECS Facility inside crucial winter ranges or migration corridors shall be closed to vehicle use during their period of use by wildlife as determined by the applicable governing agency. Vehicles for emergency and routine maintenance will be allowed as approved by the applicable governing agency.

g. Protection of Bats

WECS Facilities shall be designed to avoid identified areas of concentrated bat use as recommended by the Wyoming Game and Fish or authorized by the governing federal agency. If WECS Facilities are sited across known migration routes or between roosting and feeding areas, these Facilities may be subject to mitigation measures by the Wyoming Game and Fish or the governing federal agency. For Commercial WECS Facility Applications that involve 30 or fewer turbines and are not otherwise reviewed by the Industrial Siting Council and where surveys have determined the WECS Facility will increase bat mortality, the turbine blade minimum "cut in" speed shall be set to wind velocities greater than six meters per second or as otherwise recommended by the Wyoming Game and Fish or other governing federal authority.

h. Protection of Raptors

1. WECS Facilities shall not be permitted within or adjacent to areas of elevated raptor concentration that are recognized by the Wyoming Game and Fish Department or a governing federal agency.

2. WECS Facilities shall be designed to avoid frequently used flight paths to and from nesting and/or roosting sites as determined by Wyoming Game and Fish or a governing federal agency.

3. WECS Facilities shall be set back at a distance of at least 328 feet (100 meters) from rims to reduce mortality of soaring raptors, or as recommended by the Wyoming Game and Fish or a governing federal agency.

4. WECS Facilities shall not be located within canyons or passes to avoid conflicts with raptors, unless otherwise approved by the Wyoming Game and Fish Department or the governing federal agency.

i. Historical, Cultural and Archeological Resources

On public lands or where otherwise required by law, WECS Facilities shall avoid sites with known sensitive historical, cultural and archaeological resources as determined by Wyoming State Historical Preservation Office or the governing federal agency. If mitigation is available, the selected site may be approved subject to the acceptance of the

mitigation plan by the Wyoming State Historical Preservation Office or the governing federal agency. On private lands, the Board strongly encourages mitigation and preservation of these important historical, cultural and archaeological resources.

j. Site Management of Air, Water, Soil and Vegetation

1. Drainage

Drainage from the WECS Facility shall not adversely affect upstream and downstream properties.

2. Soil Erosion and Run-off

WECS Facilities shall avoid soil erosion and controlled runoff. Disturbance and construction on erodible soils and slopes shall be avoided.

3. Dust Control

Dust Control within all phases of the WECS Facility is mandatory, and shall be accomplished with Magnesium Chloride by means acceptable to Sweetwater County and WDEQ.

4. Noxious Weed and Invasive Species Control

Noxious weed control, as defined by Wyoming Statutes, shall be required in all phases of the WECS Facility. Invasive species, as defined by Sweetwater County Weed and Pest, shall be controlled in all phases of the WECS Facility.

5. Vegetation

Damage to existing vegetation shall be minimized. Disturbed areas shall be reseeded in accordance with WDEQ regulations and the reclamation plan approved by the Board.

6. WECS Facility Area Ground Disturbance

Minimize site disturbance by limiting the number and widths of roads, construction staging areas, crane pad sites, etc.

7. Topsoil Storage

Topsoil removed by grading shall be stored in accordance with the reclamation plan approved by the Board.

k. Noise Management

Noise Immissions from the operation of a WECS shall not exceed:

1. 45 decibels on the dB(A) scale during the hours between 7 am and 7 pm MDT, and

2. 40 decibels on the dB(A) scale during the hours between 7 pm and 7 am MDT. In addition, noise immissions shall not exceed 50 decibels on the dB(C) scale during the hours between 7 pm and 7 am. Such noise immissions shall be measured at the nearest receiving property or lot line not owned or leased to the WECS owner/operator.

   Property owners located within one and one-quarter miles of the proposed WECS project boundary, where noise immissions may exceed 50 decibels on the dB(C) scale or 45 decibels on the dB(A) scale day or 40 decibels on the dB(A) scale (night), may waive the noise management requirements by a written noise easement that meets the following requirements:

   a. The non-participating landowner is made aware of all risks in writing associated with granting the easement such as risks of potential adverse health effects from the sound levels on people and animals or property value issues including how such a lease could affect financing and future sales of the property.

   b. The noise easement will allow the WECS project to exceed the 50 dB(C) or 45/40 dB(A) on the landowner's property.

   c. The term of the noise easement shall remain in effect for the duration of the WECS project until reclamation is complete.

   d. The noise easement shall be a non-exclusive easement.

   e. The easement shall be recorded in the Sweetwater County's Clerks Office as part of the chain of title for the subject property.

   f. Easement documentation shall be approved by the Sweetwater County Attorney's Office and Board.

Noise emissions shall be free of audible and inaudible tones that exceed a Tone to Noise Ratio greater than 10 for frequencies below 1000Hz or greater than eight for frequencies of 1000 Hz and above. Procedures of ANSI S1.13 2005 (2010 or most recent) Measurement of Sound Pressure Levels in Air, Annex A Identification and evaluation of prominent discrete tones, Section A.7 Tone-to-noise ratio method.

All measurements shall be conducted using properly calibrated Type 1 sound testing instruments meeting ANSI S1.43 1997 (R2007 or most recent) Specification for Integrating-Averaging Sound Level Meters (or IEC 61672-1).

In addition, all test protocols must be in compliance with ANSI Standards for outdoor sound measurements and be under the supervision of a Full Member of the Institute of Noise Control Engineers (INCE). Applicable ANSI Standards include: S12.9, "Quantities and Procedures for Description and Measurement of Environmental Sound" Parts 1, 2, and 3; and S12.18 "Procedures for Outdoor Measurement of Sound Pressure Levels."

An anemometer accurate to ± 10% at 2m/s to full-scale accuracy. The anemometer shall be located one and one-half to two meters above the ground and orientated to record maximum wind velocity. The maximum wind velocity, wind direction, temperature and humidity shall be recorded in one minute increments at a site within five meters of the measuring microphone.

Sound tests shall meet all requirements in ANSI S12.18 Method #2, Precision, to the extent possible, while still permitting testing of the conditions that lead to complaints. The meteorological requirements in ANSI S12.18 may not be applicable for some complaint tests. For sound measurements in response to a complaint, the compliance sound measurements should be made under conditions that replicate the conditions that caused the complaint without exceeding instrument and windscreen limits and tolerances.

The report shall provide sufficient detail to permit complete peer review and include the information required in ANSI S12.18 "Procedures for Outdoor Measurement of Sound Pressure Levels" Section 9 Reporting. The report shall identify any deviations from the requirements of this regulation, explain the basis for those deviations, and explain how those deviations impact the results of the tests.

4. Commercial WECS Setbacks and Standards

Commercial Wind Generation Device	**Minimum Setbacks**	**Additional, Waivers & Similar**
Primary Structure	Five and one-half times the Wind Generation Device Height or one-half mile, whichever distance is greater.	If the person owning the primary structure waives, in writing, the setback requirement of five and one-half times the height of the Wind Generation Device, the minimum setback shall be one and one-half times the Wind Generation Device Height.
Third Party Transmission and Distribution Lines	One and one-half times the Wind Generation Device Height.	
Communication Towers	One and one-half times the Wind Generation Device Height.	
WECS Facility Boundary Line	One and one-half times the Wind Generation Device Height or a minimum distance of 1,600 feet, whichever distance is greater.	
County Residential Zone District and any City and Town	One and one-quarter Miles	
Any Platted Subdivision	One and one-quarter Miles	

Right-of-Way (ROW) of all Federal, State, County and Municipal Roads	Five and one-half times the Wind Generation Device Height or one-half mile from the ROW, whichever distance is greater.	Unless waived by the Board. Measured from the edge of the ROW.
Railroads	Five and one-half times the Wind Generation Device Height or one-half mile from the ROW, whichever distance is greater.	Unless waived by the Board. Measured from the edge of the ROW.
Federal, State and County Parks, National Recreation Areas and Wildlife Refuges	A minimum distance of one mile.	Unless waived by the Board upon recommendation from the applicable agency.

A waiver from the setback requirements shall run with the land and shall be recorded as part of the chain of title for the subject property. Copies of the recorded waivers shall be furnished to the County and included in the application file.

Setbacks shall be measured from the center of the Wind Generation Device foundation.

E. Transportation and Other Public Infrastructure

1. Transportation Plan

Any Applicants proposing to use any public or private roads for the purpose of transporting WECS Facility components or equipment for construction, operation, maintenance and decommissioning shall submit a Transportation Plan, prepared by a Wyoming Licensed Professional Engineer, that addresses and includes the following:

a. Legal Access and Public Roadways

A report demonstrating how legal access will be provided to the WECS Facility. The report shall describe how private roadways within the project will be marked as private roadways and shall acknowledge that the County is not required to repair, maintain or accept any dedication of the private roadways to the public use.

b. WECS Facility Roadways and Haul Routes

A report, with plans and maps, prepared by a Wyoming Licensed Professional Engineer, that:

1. Explains and identifies all existing and proposed county, public, federal resource roads and private roads expected to be used in the construction, operation and decommissioning of the WECS Facility, including all roads that will be used as WECS Facility haul and transportation routes for all equipment and materials necessary for the WECS Facility.

2. Includes the anticipated height, width, length, and weight data for all WECS Facility loads to be transported and the plan for upgrading, maintaining and reclaiming.

3. Provides plans demonstrating compliance with the application site plan requirements.

c. Traffic Study

A traffic study, prepared by a Wyoming Licensed Professional Engineer, of any public roadways leading to and away from the proposed project during construction, operation and decommissioning. This traffic study must assess the existing roadway conditions, evaluate the ability of the existing roadways and proposed roadway to accommodate WECS Facility traffic loads, identify proposed mitigation measures to address roadway impacts and propose a plan to implement identified mitigation measures. This traffic plan must address costs of mitigation. These costs are the responsibility of the Developer and must be addressed to the satisfaction of Sweetwater County in the Road Use and Maintenance Agreement.

2. Road Use and Maintenance Agreement

The Board shall require the Applicants to enter into a Road Use and Maintenance Agreement for the use of County roads prior to construction of the project. The Road Use and Maintenance Agreement shall be developed by the Applicants for review by the Sweetwater County Engineering Department, Land Use Department, and the County Attorney's Office. In the Road Use and Maintenance Agreement, the Applicant shall certify and acknowledge that:

a. Prior to preconstruction, site occupancy, over lot grading or construction of any component of the WECS Facility, the Applicant shall obtain and submit to Sweetwater County copies of all approved Federal, State and local government or agency required permits related to access, access modification, change of use of access permits; utility crossing permits or approved plans required by applicable governments and agencies necessary to address and mitigate impacts to any Federal, State or County Highway/Road facilities.

b. The Applicant(s) shall conduct a pre-construction baseline survey to determine existing road conditions for assessing potential damage to roadways due to the WECS Facility.

c. The use of public roads and other public infrastructure shall be in accordance and compliance with existing regulations governing such activities. Any degradation to or damage of public roads or other infrastructure by parties affiliated with the installation, operation or maintenance of the WECS Facility shall bear all costs required to return the public roads or other infrastructure to their original or better condition.

d. The Applicant shall submit Financial Assurance in a sufficient amount to repair damage to all public roadways attributed to the construction, operation and maintenance of the WECS Facility. Said Financial Assurance shall be signed and sealed by the Applicant's engineer and approved by the Sweetwater County Public Works Director for final approval by the Board.

F. Operations and Maintenance

1. The Developer or Operator shall perform routine and scheduled maintenance including the repainting of equipment and structures and servicing of the grounds and landscape. If the WECS Facilities are under the jurisdiction of the Wyoming Public Service Commission, the requirements of this subparagraph may not apply.

2. All solid wastes and hazardous materials related to the construction, operation and maintenance of a WECS Facility shall be handled, stored or disposed of in accordance with the approved waste management plan and in accordance with all applicable Federal, State and County laws and regulations.

3. On April 1st of every even numbered year after the third anniversary of the permit, the Developer or Operator of the WECS Facility shall submit to the Department a statement that lists all WECS Towers currently inoperative for longer than six continuous months. All WECS Towers that remain inoperative for 18 continuous months or longer must be removed unless the Developer or Operator provides a written plan and schedule acceptable to the Board for refurbishing and\or reactivating the inoperative WECS. If the Developer or Operator of the WECS Facility is regulated by the Wyoming Public Service Commission, the requirements of the second sentence of this subparagraph may not apply.

4. The Developer or Operator of the WECS Facility shall control and eradicate noxious and invasive weed species within the disturbed areas of the project. Weed control shall be maintained as directed by the Sweetwater County Weed and Pest Control District or the appropriate public entity having jurisdiction.

5. To the extent not inconsistent with confidentiality and security obligations under State and\or Federal law; the Developer or Operator shall provide the Department with a detailed map of the site within 90 days of when operation begins. This map will include the geographic coordinates of each WECS structure, all roads within the WECS Facility area, and public roads and turnouts connecting to roads of the WECS Facility. This map shall be updated by the Developer or Operator every five years or after the completion of any significant additional construction, whichever occurs first, and approved by the Department.

G. General WECS Facility Decommissioning, Reclamation, and Financial Assurance

1. WECS Facilities owned or operated by a Public Utility subject to requirements of the Public Service Commission are exempt from Sweetwater County's and Wyoming Industrial Siting Council's decommissioning, reclamation and financial assurance requirement in accordance with W.S. 35-12-105(d) and (e). Documentation that the proposed WECS Facility is owned or operated by a Public Utility and subject to the requirements of the Public Service Commission shall be provided with the application.

2. Commercial WECS Facilities under the jurisdiction of the Industrial Siting Council as provided under Wyoming Statute 35-12-102(a)(vii)(E) and (F) shall submit a WECS Facility decommissioning and reclamation plan and financial assurance that complies with the criteria of W.S. 35-12-105(d) and (e) and the Rules and Regulations of the Industrial Siting Council.

3. For all other Commercial WECS Facilities, pursuant to W.S. 35-12-102(a)(vii)(E) and (F), which are not subject to the Wyoming Industrial Siting Council, the applicant or developer shall meet the

Sweetwater County WECS Facility Decommissioning, Reclamation and Financial Assurance Regulations as stated in these Regulations.

4. The chart below provides regulatory requirements for reclamation and decommissioning.

Categories of Commercial Wind Energy Facilities	**Regulatory Jurisdiction Regarding Decommissioning, Reclamation, Financial Assurance.**
WECS Facility development cost estimates meet or exceed the qualifying amount for an Industrial Siting Council Project.	Wyoming Statute 35-12-102(a)(vii)(E) and (F) and 35-12-105(d) and (e); Industrial Siting Council Rules and Regulations.
WECS Facilities that contain 30 or more WECS Towers.	Wyoming Statute 35-12-102(a)(vii)(E) and (F) and 35-12-105(d) and (e); Industrial Siting Council Rules and Regulations
WECS Facilities that contain less than 30 WECS Towers, accepted by the Industrial Siting Council after referral by the Board on the basis of environmental, social or economic factors.	Wyoming Statute 35-12-102(a)(vii)(E) and (F) and 35-12-105(d) and (e); Industrial Siting Council Rules and Regulations
WECS Facilities that contain less than 30 WECS Towers not referred by the Board nor accepted by the Industrial Siting Council.	Sweetwater County Decommissioning, Reclamation and Financial Assurance Regulations

H. WECS Facility Decommissioning, Reclamation, and Financial Assurance

1. WECS Facility Decommissioning

The applicant shall provide a WECS Facility Decommissioning Plan which includes the following:

a. Provisions regarding the removal and proper disposal of all wind turbines, towers, substations, buildings, structures, cabling, electrical components, foundations to a depth of 48 inches from original grade, and any other associated or ancillary equipment or structures within the facility boundary above and below ground.

b. The Developer may request that buildings be left on site if approval is obtained from the owner and upon written notification to the Board.

c. WECS Facility or individual Wind Generation Device decommissioning shall begin:

1. Within 12 months after the end of the useful life of the facility or individual Wind Generation Device, or

2. When no electrical energy is generated for a continuous period of 12 months by the facility or individual Wind Generation Device.

3. If the WECS Facility provides good cause prior to the end of the continuous period stated herein, the Board may extend the time for decommissioning once the generation of electricity has ceased for the facility or individual Wind Generation Device.

d. The facility decommissioning plan shall be updated and submitted to Sweetwater County every five years.

2. Interim Reclamation

Interim Reclamation shall comply with the applicable permitting requirements of the Department of Environmental Quality Water Quality Division Storm Water Program.

3. Final Reclamation

The applicant shall provide a final reclamation plan which shall include:

a. A detailed description of site conditions prior to construction, including topography, vegetative cover (including plant species and plant community structure), climate and land uses.

b. Provisions regarding the regrading of all WECS Facility component and structure foundations, roads, and all other surface disturbances within the facility boundary to the natural contours of the area. Backfilling, grading and contouring of affected land shall be accomplished by one or more of the following as detailed in the approved reclamation plan:

1. Re-establishment of the contour of the land in a manner consistent with the proposed future use of the land.

2. Contouring affected land to blend in with the topography of the surrounding terrain unless doing so would create an erosion problem or hazard.

3. The WECS facility may leave a road un-reclaimed if approval is obtained from both the surface landowner and the Board.

c. Re-vegetation.

1. After backfilling, grading and contouring, and the replacement of topsoil, re-vegetation shall be commenced in such a manner so as to most efficiently accommodate the retention of moisture and control erosion on all affected lands to be re-vegetated.

2. Re-vegetation requirements shall include seedbed preparation, seed mixture, and post seeding maintenance of all disturbed areas.

3. If applicable, documentation of any mulching and/or use of fertilizers.

4. Reclamation shall consist of restoring the land using native or adaptive perennial vegetative cover to a condition equal to, or better than, the original condition.

5. Re-vegetation of all affected lands shall be accomplished in a manner consistent with the approved reclamation plan and the proposed future use of the land.

6. Seeding of affected land shall be conducted during the first normal period for favorable planting conditions after final preparation, unless an alternative plan is approved by the Board. The species of vegetation to be used in re-vegetation efforts shall be described in the reclamation plan indicating the composition of seed mixtures and the amount of seed to be distributed on the areas on a per acre basis.

7. The developer must control and minimize the introduction of noxious weeds into the re-vegetated areas until final reclamation is achieved.

d. The final reclamation plan shall be updated and submitted to the Board every five years.

4. Financial Assurance

The applicant shall provide Financial Assurances sufficient to assure complete decommissioning and site reclamation of the WECS Facility in accordance with the provisions of these rules. WECS Facilities subject to regulation by the Public Service Commission shall be exempt from these Financial Assurance provisions and from the Cost Estimation of Decommissioning and Site Reclamation provisions of these regulations.

a. All Financial Assurances shall be in place prior to commencement of construction of any WECS Facility.

b. The amount of the Financial Assurance shall be adjusted up or down every five years from the date of permit issuance by the Board based on the results of Final Reclamation.

c. Additional Financial Assurances to cover risks not anticipated at the time of the permit may be required at any time by the Board, as reasonable and necessary, provided that the Board first gives 30 days written notice stating the reason for and the amount of the additional Financial Assurance.

d. Financial Assurance in the form of domestic securities may be accepted in any of the following forms at the discretion of the Board with consideration of credit worthiness, financial strength, credit history, credit rating and debt.

1. Surety bond with a corporate surety registered in Wyoming.

2. Certificate of deposit in the name of "Sweetwater County" with a state or federally insured financial institution in Wyoming. The permittee shall be entitled to all interest payments.

3. Other forms of assurance such as corporate guarantee, letter of credit, insurance policy, or other forms of assurance as may be acceptable to the Board.

5. Cost Estimation for Decommissioning and Site Reclamation of the WECS Facility

a. Estimates of cost for decommissioning and site reclamation shall be made by a Wyoming Licensed Professional Engineer and subject to review and approval by the Board.

b. Total decommissioning costs shall be estimated without regard to the salvage value of the equipment.

c. Decommissioning and site reclamation estimates shall be submitted to the Board in the application and every five years after the date of permit issuance until the completion of final reclamation.

d. The Wyoming Licensed Professional Engineer estimate of decommissioning and reclamation costs shall include the following:

1. A general discussion of assumptions, including equipment, timeframes, backup calculations, procedures, methods and any other considerations used in developing the cost estimate.

2. A detailed description of the decommissioning activities to be performed.

3. A detailed description of the reclamation activities to be performed.

e. The Developer may request release of the Financial Assurance mechanism when the facility has achieved final reclamation. Final reclamation means that all surface disturbances have been re-graded and re-vegetated with a uniform perennial vegetative cover with a density of 90% of the native or adaptive background vegetative cover. Noxious weeds shall not be included in the density requirement in determining reclamation success.

6. The Board may grant a case by case variance to requirements of WECS Facility Decommissioning, Reclamation and Financial Assurance Regulations after considering whether good cause is shown by the applicant or landowner.

I. Approval Process for WECS Facility Permit

1. Pre-Application Submittal Meeting

Prior to submitting an application for a Commercial WECS Facility Permit, the applicant shall arrange and attend a Pre-Application Meeting with the Department.

2. Application Submittal Meeting

After preparing an application for the Commercial WECS Facility Permit, the applicant shall arrange for and attend an Application Submittal Meeting. The purpose of this Meeting is for the Department to provide a summary review of the Application. This review determines whether the application is generally complete and is not missing major application components, such as the Transportation Plan or the Social and Economic Study. If, during this meeting, application components are found missing, the applicant has the following options:

a. The applicant may file the application as a final application to begin the review period by the Board as required by Wyoming Statute 18-5-505, or

b. The applicant may correct the identified application deficiencies and formally resubmit the corrected application at a later date.

It is important to note that the Application Submittal Meeting review by Staff is intended to be a summary review that assists the applicant to determine if the application contains the required components. This review is not a substitute for the statutory completeness review conducted by the Board, nor does this summary review commit the County to a finding that any of the required application components are complete.

3. Upon receipt of an application, the Board shall review the application to determine if it contains all the information required by W.S. 18-5-503, these regulations and any other applicable rules and regulations. If the Board determines that the application is incomplete, it shall, within 30 days of receipt of the application, notify the Applicant(s) of the specific deficiencies in the application. The Applicant(s) shall provide the additional information necessary within 30days of receipt of a request for additional information. When the Board determines that the application is complete it shall notify the Applicant(s) that the application is complete and shall provide notice of the date and time at which the hearing required by W.S. 18-5-506 and these regulations shall be conducted. The determination by the Board that an application is complete is no assurance that a particular outcome will be achieved at the public hearing.

4. The Board shall hold a public hearing to consider public comment on the application no less than 45 days and not more than 60 days after determining that the application is complete. Written comments on the application shall be accepted by the Board for not less than 45 days after determining that the application is complete.

5. Decision of the Board and Findings Necessary

a. Within 45 days from the date of completion of the hearing required by W.S. 18-5-506, the Board shall make complete findings, issue an opinion, render a decision on the record either granting or denying the application and state whether or not the Applicant(s) has met the applicable standards. The decision shall be subject to the remedies provided in W.S. 18-5-508. The Board shall grant a permit if it determines that the proposed WECS Facility complies with all standards properly adopted and the standards required by this regulation.

b. No permit shall be granted if the application is incomplete or if all notices required by this regulation and W.S. 18-5-503(a)(i) & (ii), and 18-5-504(c) have not been met.

c. A copy of the decision shall be provided to the Applicant(s).

J. Administration & Enforcement of Commercial WECS

1. Liability Insurance

a. The applicant and or operator(s) of the WECS Facility shall maintain a current general liability policy covering bodily injury and property damage with limits of at least $5 million

per occurrence and $10 million in the aggregate. The applicant(s) shall provide proof of insurance to the Board prior to the approval of the submitted application. If the application is approved, the owner(s) or operator(s) of the WECS shall provide proof of insurance annually.

2. Transfer of WECS Facility Permits

   a. Notification of a proposed change of owner of the WECS Facility shall be provided to the Board 45 calendar days prior to any such change taking place. Documentation evidencing any such transfer shall be submitted to the Board within 20 days after such transfer is complete. The transferee upon transfer of ownership shall be responsible for assuming all obligations under the approved WECS Facility Permit.

3. Revocation or Suspension of WECS Facility Permit

   a. A WECS Facility Permit may be revoked or suspended by the Board for:

      1. Any materially false statement in the application or in accompanying statements or studies required of the Applicant(s).

      2. Failure to comply with the terms or conditions of the permit after notice of the failure and reasonable opportunity to correct the failure.

      3. Failure to comply with the requirements in W.S. 18-5-501 through 18-5-513, or failure to comply with any order, rule or regulation which has been adopted under the authority of these statutes by the Board, or any rule or regulation of the Industrial Siting Council.

      4. Failure of the proposed WECS Facility to receive a required permit from the Industrial Siting Council pursuant to the Industrial Development Information and Siting Act, W.S. §35-12-101 through §35-12-119; or

      5. Failure of the permitted WECS Facility to:

         i. Transmit electricity created by wind energy for a period of two consecutive years or more;

         ii. Maintain land rights necessary to operate the WECS Facility.

4. Expiration of WECS Facility Permits

   a. Any WECS Facility for which a WECS Facility Permit is granted under this section must be commenced within three years from the date of approval by the Board. If the WECS Facility is not commenced within three years from said date of approval, then the WECS Facility Permit shall expire and become null and void and be of no further effect. If the WECS Facility is not operational within two years from the date of project or phase commencement, then the WECS Facility Permit shall expire and become null and void and be of no further effect. If the WECS Facility is to be constructed in phases, the applicant shall submit the schedule for completion of each phase for Board approval with the

application, subject to a time limit of seven years for phased development, which means all phased projects must be completely operational within seven years of the date that the WECS permit was approved.

b. For the purpose of this section, "commencement of construction" means storage of construction equipment and vehicles on the project site, grading, road construction, and initiation of construction of a WECS Facility. For the purpose of this section, the WECS Facility shall be considered to be "operational" if the project is transmitting electricity.

c. If the WECS Facility has not been commenced or has not become operational as required, the Applicant(s) may request an extension of the permit. The Applicant(s) shall apply to the County in writing for the extension no later than 90 days prior to the expiration of the permit. At the time of the application for the extension, the Applicant(s) shall provide such information as is necessary for the County to determine whether good cause exists for the extension. Such information may include, but is not limited to, good faith efforts to obtain required authorization for the WECS Facility from other agencies having jurisdiction, such as the Wyoming Industrial Siting Council, delay in construction due to weather conditions, or other causes which have delayed the project and which are beyond the reasonable control of the Applicant(s). The Board shall promptly consider the application for the extension and either allow it or deny it. No permit shall expire during the time the decision on the extension is being considered.

5. Penalties for Violations of Commercial WECS's

a. No person shall:

1. Commence to construct a WECS Facility on or after July 1, 2010 without first obtaining a permit required by W.S.18-5-501 through 513 and this section;

2. Construct, reconstruct, operate, locate, erect, maintain, enlarge, change or use a WECS Facility after having first obtained a WECS Facility permit, other than in specific compliance with the permit; or

3. Cause any of the acts specified in this subsection to occur.

b. Any person violating subsection (a) of this section is liable for a civil or criminal penalty as provided for in Wyoming Statute 18-5-512 or as amended.

6. Industrial Siting Council Referral

The Board may refer any application to the Industrial Siting Council to permit a WECS Facility which does not meet the definition of a facility as defined by W.S. 35-12-102(a)(vii) subject to the provisions found under W.S. 18-5-509 and W.S. 18-5-510.

7. Periodic Inspections

a. Staff may perform periodic inspections of the WECS Project to verify WECS Facility Permit requirements.

b. The Project Owner or Operator shall provide an affidavit to the Department every five years certifying that the WECS Project is in compliance with their WECS Facility permit.

K. Commercial WECS Facility Construction Permit

1. Upon approval of the WECS Facility permit, the applicant shall submit to the Department a complete Sweetwater County Commercial WECS Facility Construction Permit application that includes all of the following:

   a. Evidence that all applicable conditions and terms of the approved WECS Facility Permit have been satisfied.

   b. Construction Drawings. Building and foundation plans stamped by a Wyoming Licensed Professional Engineer as required.

   c. Floor plans of all buildings.

   d. A final plan for site security.

   e. Final documentation that the project is in compliance with all of the requirements of all applicable state and federal agencies.

2. After the Department receives a complete Commercial WECS Facility Construction Permit application, the Department will review it for compliance, and, if approved, the Department will issue the permit.

3. The Commercial WECS Facility Construction Permit shall be enforced pursuant to these regulations.

L. Non-Commercial WECS Facility Permit and MET Towers

Non-Commercial WECS Facilities and MET Towers will be administered in accordance with the following requirements and these regulations:

1. Non-Commercial WECS Facility Permit Standards and Application Requirements

   a. Maximum Wind Generation Device Height

      Parcels less than five acres in size shall have a maximum Wind Generation Device height of 60 feet. Parcels five acres in size and larger shall have a maximum Wind Generation Device height of 100 feet.

   b. Maximum Wind Generation Device Limit

      Parcels five acres in size and less shall be limited to one Wind Generation Device. Parcels five acres and more shall be limited to two Wind Generation Devices unless approved by the Board.

c. Noise

Sound emitted by a Wind Generation Device shall not exceed:

1. 40 decibels on the dB(A) scale during the hours between 7 am and 7 pm MDT, and

2. 35 decibels on the dB(A) scale during the hours between 7 pm and 7 am MDT. In addition, noise immissions shall not exceed 50 decibels on the dB(C) scale during the hours between 7 pm and 7 am. Such noise immissions shall be measured at the nearest receiving property or lot line. All other requirements of Noise Management shall be followed.

d. Setbacks

No Wind Generation Device shall be constructed on any property a distance of less than 150% of the Wind Generation Device Height from all adjacent property lines.

e. Clear Zone

The Wind Generation Device shall be maintained in a circular clear zone that has a radius which is equivalent to 110% of the wind generation device height. The clear zone shall be maintained free of any occupied structure, tanks containing combustible/flammable liquids and above ground utility/electrical lines.

f. Tower Security

All WECSs or Wind Generation Devices shall be un-climbable.

g. Lighting

All WECS structures shall have International Dark-Sky Association compliant fixtures or an approved equal in accordance with FAA regulations.

h. Advertising

No WECS or Wind Generation Device shall have any writing or picture that may be construed as advertising.

i. Colors

All towers shall be standard colors as provided by the manufacturer.

j. Approved Non-Commercial WECS or Wind Generation Device

At the time of application, the Applicant must present a certification from the manufacturer that the all of the system's turbines and other components are equal or exceed the standards of one of the following national certification programs such as the Institute of Electrical and Electronics Engineers ("IEEE"), National Electric Code (NEC), National Electric Safety

Code, (NESC), American National Standards Institute (ANSI) or any other appropriate recognized standard and in no case shall the standards be less stringent than the requirements of the most recent edition adopted by the State of Wyoming.

k. Utility Notification

If applicable, permit applications for Non-Commercial WECS shall be accompanied by evidence that the utility company serving the property of the Applicant has been informed of the customer's intent to install an interconnected customer owned generator.

2. Administration and Enforcement of Non-Commercial WECS Facility Permit

a. Removal of Defective or Abandoned WECS's or Wind Generation Devices

1. Any Wind Generation Device found to be unsafe by an authorized County official, or designated authority, shall be repaired or removed with all due urgency within 14 days by the Owner(s) to meet federal, state and local safety standards. If any WECS Tower is not operational for a continuous period of 12 months, the County will notify the landowner by registered mail and provide 30 days for a response. In such a response, the landowner shall set forth reasons for operational difficulty and provide a reasonable timetable for corrective action. If the County deems the timetable for corrective action as unreasonable, they must notify the landowner and such landowner shall remove the turbine within 120 days of receipt of notice.

b. Construction Permit

No person shall construct a Non-Commercial WECS Facility without first obtaining a Construction permit for a Non-Commercial WECS Facility.

c. Maintaining Compliance

All Non-Commercial WECS or Wind Generation Devices shall be maintained as per the manufacturer's specifications.

d. Neighborhood Concerns

All reasonable concerns of neighbors must be resolved before a Construction Permit for a Non-Commercial WECS Facility will be issued. To help identify and mitigate neighborhood concerns early in the permitting process and after receiving a Construction Permit application, the Department shall send a request for comment form to all property owners within 200 feet of the applicant's property, and will post the applicant's property with a sign that states the nature of the applicant's proposed Non-Commercial WECS Facility.

1. If the Department has not received any written objections during the 21 days following the latest date of either the posting or of the mailing of the request for comments, the Department will approve the applicant's request provided all requirements of these rules are met.

2. If any written objections are received, the Department will schedule a public hearing before the next regularly scheduled Commission meeting that allows for 30 day advertised notice.

3. At the public hearing, the Commission will take testimony concerning objections to the proposed Non-Commercial WECS. After hearing and considering all testimony from staff and concerned parties, the Commission will then make a recommendation to the Board to approve, conditionally approve or deny the application.

4. The Board shall conduct a public hearing on the application for a Non-Commercial WECS. The Board may approve, conditionally approve or deny the application at the conclusion of the public hearing based on evidence, comments, and the recommendation from the Commission. Notice of the hearing shall be provided in the same manner as for an application for a public hearing.

e. Penalties and Violation of Non-Commercial WECS Facility Permit

Violations of these regulations for Non-Commercial WECS Facilities shall be enforced in accordance with the Sweetwater County Zoning Resolution and pursuant to Wyoming Statute 18-5-204 through 18-5-206.

f. Fees – Non Commercial WECS Facility Permit Fees

The application fee for a WECS Non-Commercial Construction Use Permit as provided for in this Resolution.

M. Fees – Commercial WECS Facility

1. Commercial WECS Facility Permit Fee

The fee for a Commercial WECS Facility Permit shall be used to reimburse all staff costs that are incurred to review and process a Commercial WECS Facility Permit Application. The Department shall record all staff time, equipment, and expenses related to persons with the required expertise to review and process a Commercial WECS Facility Permit Application. This shall include, but not be limited to, meetings with County staff, meetings with the BLM and public agencies, completeness review required by County staff following the filing of an Application, review and public hearing preparation and processing. A Reimbursement Account shall be established for the Applicant when a Commercial WECS Facility Permit Application is filed. At the time of filing, the Applicant shall fund the Reimbursement Account in the amount of $50,000. The Applicant shall provide additional funding to the Reimbursement Account at any time the account becomes less than $20,000. The Department shall submit periodic invoices to the Reimbursement Account. Any fees remaining in this Reimbursement Account after issuance of a Commercial WECS Facility Permit shall be credited to the Reimbursement Account for a Commercial WECS Facility Construction Permit.

2. Commercial WECS Facility Construction Permit Fee

The Permit Fee for a Commercial WECS Facility Construction Permit shall be used to reimburse all staff costs, including vehicle and equipment costs, the value of all staff time allocated to

processing the application, and the expenses reported by any person with particular expertise that is hired to assist the County in reviewing the application and in determining compliance with all requirements of the applicant identified herein. The Department shall record all staff time and equipment required to issue the permit and conduct inspections. This shall include, but not be limited to, meetings with County staff prior to issuing the Construction Permit, meetings with other public agencies prior to issuing the Commercial WECS Facility Construction Permit, and site inspections. A Reimbursement Account shall be established for the Applicant when a Commercial WECS Facility Construction Permit is approved. At the time of permit approval, the Applicant shall fund the Reimbursement Account in the amount of $50,000. The Applicant shall provide additional funding to the Reimbursement Account at any time the account becomes less than $20,000. The Department shall submit periodic invoices to the Reimbursement Account.

3. If the applicant fails to provide the required payments to the Reimbursement Account, all efforts and work on the project shall cease.

4. Once all construction has been completed and the project is operational, all fees paid by the applicant remaining in the Reimbursement Account will be returned.

WCO | WIND CONCERNS ONTARIO

RESPONSE TO WIND TURBINE NOISE COMPLAINTS

by the Ontario Ministry of the Environment and Climate Change

Second report: complaints 2015-2016

February 2018

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SECOND REPORT ON WIND TURBINE NOISE COMPLAINTS TO MOECC 2015–2016

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INTRODUCTION

This is the second of two reports prepared by Wind Concerns Ontario (WCO), related to how the Ministry of the Environment and Climate Change (MOECC) handles wind turbine noise complaints. The first report was published in May 2017 and was based on noise complaints from 2006 to the end of 2014, released to WCO in early 2017. This current report provides an update to the earlier report as it covers noise complaints in the 2015–2016 period, along with other information provided by the MOECC over the past year.

In April 2017, Lisa Thompson, Huron-Bruce MPP, asked a question in the Ontario Legislature regarding resolution of one set of complaints about the wind turbine noise emissions experienced by two resident families. In response, then Minister of the Environment and Climate Change, Glen Murray assured members of the Legislature that:

> *The challenge here is that the law works. There are standards. When people call, I'm very proud of the officials. They respond quickly and they enforce the law. The law is being enforced here. If wind turbines or any other type of technology exceeds sound levels, we enforce the law.*
>
> *I am happy to meet with the member opposite to review this case to make sure that the ministry is being diligent. No one should have to suffer noise or noise pollution from any source, and certainly not wind turbines in their community.*[1]

In the main, both WCO documents point to the same disturbing conclusion: despite the Minister's confident words, his Ministry didn't respond to residents' complaints.

Summary of Initial Report

In 2015, Wind Concerns Ontario requested copies of all noise complaints filed with the Ministry of the Environment (later Ministry of Environment and Climate Change) for the period 2006 to end of 2014. After two years, and several appeals, WCO received documents that were probably not the full story. Nevertheless, the information that was provided told an interesting tale of how Ontario's government responded to citizen complaints about wind turbines.

The records showed that in more than 50% of the more than 3,000 formal complaints, there was no ministry response. Another 30 % were noted as "deferred" response — with no definition or criteria as to what that means. In fact, only 1% of the reports received a "priority" response.

Wind Concerns Ontario published a report on the 2006–2014 documents, which became the basis for a series of news stories by Global News in June, 2017.

THE FINDINGS 2015–2016

Almost immediately after receiving the 2006–2014 documents, Wind Concerns Ontario requested[2] the same type of records for the period 2015–2016. The request was fulfilled after nine months.

The documents provided by the Ministry of the Environment and Climate Change (MOECC) were 1,394 Pollution Incident Reports (IRs), and 61 Master files. The Master files contained 1,301 Incident Reports.

[1] Hansard, Ontario Legislature, Oral Questions, Session: 41:2 Date: Wednesday, April 12, 2017

[2] Freedom of Information request A-2017-00734

The table below indicates the apparent response to citizen reports of noise, vibration, shadow flicker and other effects associated with the wind turbines.

MOECC action	No. of IRs	As %
"Y" - ? YES (unconfirmed)	34	2.4%
Some action taken	63	4.5%
No field response but follow-up completed	29	2.1%
No field response	4	0.3%
"N" - ? No field response (unconfirmed)	1,143	82.0%
Blank	183	13.1%
TOTAL	**1,394**	100.0%

For the 2015–2016 documents, the response rate is apparently 4.5% for "some" action taken, and 2.4% for "Y" which one might presume to be "yes" for a total of 6.9 %. (At the time of writing, WCO has yet to receive a reply to an inquiry of the MOECC as to what the Y and N symbols might mean on the Incident Reports.[3])

This is a *decline* from the findings for the 2006–2014 documents which showed at least some response for over 40%, though a "Priority" response in only 1% of the Incident Reports.

Limitations in the data

There are insufficiencies in the documents provided which may constitute a failure to respond fully to the information request:

- 19 records do not name the project for which the citizen complaint was made;
- 754 pages were deemed "not relevant" without explanation;
- In one master file, eight of ten pages including the project name were deemed "not relevant" without explanation.

The total number of IRs provided for 2006–2014 was 3,180 but it is almost certainly not complete. Several offices did not give out tracking numbers, for example, so their records would not have been provided in our request. Wind Concerns Ontario also conferred with people who had made reports to the Spills Action Centre and received IR numbers — in some cases these were not represented in the documents provided. So, the total number of IRs for two years, 2015–2016 is about one-third as many as for eight years, but two factors are at play: first, there are now more wind power projects operating, and second, there is probably significant complainant fatigue, which is understandable given the lack of action. This latter fatigue effect has been seen in other countries, notably Australia, and was commented on by a special Senate Committee in that country.

The apparent total of Incident Reports for 2006–2015 then is 4,574 — again, this is probably not complete as we know people were routinely not give Incident Report numbers at the time of filing a complaint, so that their reports cannot therefore be tracked.

[3] The MOECC was queried as to the meaning of the short forms, and WCO was referred to the Manager for the Owen Sound Office, Rick Chappell. Mr. Chappell has not responded to the inquiry.

RESPONSIBILITIES OF THE MOECC

Under the Environmental Protection Act (EPA), the MOECC is given several mandates to protect the residents of Ontario from negative environmental conditions.

► Compliance with Audible Noise Limits

The MOECC has the power to prevent operations taking place that are outside of the terms of the environmental approval:

> *9 (1) No person shall, except under and in accordance with an environmental compliance approval,*
>
> *(a) use, operate, construct, alter, extend or replace any plant, structure, equipment, apparatus, mechanism or thing that may discharge or from which may be discharged a contaminant into any part of the natural environment other than water;*[4]

Renewable Energy Approvals (REAs) for wind power projects set out audible noise standards for emissions from wind turbines. A protocol for auditing compliance with these audible noise standards is in place, and was revised in April 2017.

► Ensure Resolution of Complaints

The REAs also require the wind power operators to act to address complaints about the adverse effects created by the wind turbines adjacent to their homes. This REA clause expands the scope of the MOECC enforcement responsibilities as the protocol set out by the Ministry to assess compliance with the noise standards is seriously flawed — it ignores many situations that are causing the adverse effects that local residents experience.

For example, the Renewable Energy Approval for the K2 project makes the project proponent responsible for addressing complaints it receives, with three specific requirements:

- *O 1 (3) Maintain records of any complaint alleging Adverse Effect caused by the operation of the facility*
- *O 2 (3) Descriptions of measures taken to address the cause of each incident to which the complaint relates and to prevent a similar occurrence in the future*
- *P 2 Provide the District Manager with written records created in response to complaints within 8 business days of the receipt of the complaint*[5]

Similar wording regarding the handling of complaints has been included in all REAs (as well as earlier Certificates of Approval) meaning that these requirements for action should apply to all the 4,475 complaints that the MOECC acknowledges as having received about wind turbine operations between 2006 and 2016. The repetitive nature of the various complaints about adverse effects provided to wind power companies and the MOECC suggests that wind power developers/operators have failed to live up to the terms of their approvals by allowing conditions that are triggering our complaints to continue.

[4] Section 9 (1), Environmental Protection Act, R.S.O. 1990, c. E.19
[5] MOECC Renewable Energy Approval, # 3259-98EQ3G issued to K2 Wind Ontario Inc., July 23, 2013

Under Section 9, this lack of response to these complaints warrants an enforcement response from the MOECC.

► **Address All "Adverse Effects"**

The term "adverse effect" that is used in the REAs is broadly defined in the Environmental Protection Act.

> *"adverse effect" means one or more of,*
> *(a) impairment of the quality of the natural environment for any use that can be made of it,*
> *(b) injury or damage to property or to plant or animal life,*
> *(c) harm or material discomfort to any person,*
> *(d) an adverse effect on the health of any person,*
> *(e) impairment of the safety of any person,*
> *(f) rendering any property or plant or animal life unfit for human use,*
> *(g) loss of enjoyment of normal use of property, and*
> *(h) interference with the normal conduct of business*[6]

This definition covers the full range of situations documented at various times in the complaints filed by residents since the program began operation in 2006. These complaints extend beyond audible noise issues that would be covered in the compliance testing to include low frequency noise, infrasound and shadow flicker.

Based on the reporting requirements in the REA, the MOECC must be aware that the wind companies have not properly addressed these complaints. When a regulated entity fails to live up to the terms of the approval for a project, it is the responsibility of the Ministry to take regulatory action. Simply ordering a compliance audit is not sufficient as so many of the situations identified will not be addressed by the audit.

► **Stop Orders**

MOECC Directors have authority under the EPA to issue stop orders when people's health is at risk:

> *8 (1) When the Director, upon reasonable and probable grounds, is of the opinion that a source of contaminant is discharging into the natural environment any contaminant that constitutes, or the amount, concentration or level of which constitutes, an immediate danger to human life, the health of any persons, or to property, the Director may issue a stop order.*[7]

ADVERSE HEALTH EFFECTS REPORTED

The people of Ontario who are forced to live within wind power generation facilities continue to report adverse health effects. These effects were noted by Provincial Environment Officers and Spills Action Centre staff in various Master files. Documented health effects include headache, sleep deprivation,

[6] Section 1 (1), Environmental Protection Act, R.S.O. 1990, c. E.19
[7] Section 8 (1), Environmental Protection Act, R.S.O. 1990, c. E.19

annoyance, and ringing or pressure sensation in the head and ears. Most disturbing was the fact these health effects were reported many times, and also among children.

Some excerpts from Spills Action Centre staff notes:

- "[noise occurs] *same time around 0300 every day … waken up with a headache*" Source: IR 3172-A4JBGA File status: closed
- "*Caller states that she wakes up every morning between the hours of 0300-0400 with a headache and earache*" Source: IR 6238-A3W7SJ File status: No response, closed.
- *"whooshing and thumping so loud right into the house … could not sleep"* Source: IR 6805-A3YUSF. File status: no response, closed.
- *"Again last night it was terrible in our house. We were still awake at 1:30 a.m. and awake many times after. We are so tired we just want to sleep. Please tell us how to do that. Please respond."* Source: IR 6868-ACPNBQ. File status: no response, closed "by the ADM"
- "*After a week of east wind and no sleep in our house this has become intolerable … it is up to you to address this … sleep deprivation is recognized as a form of torture…"* Source: IR 7463-AA9M9A. File status: In progress
- *"… extreme headache, fatigue, ringing pressure in ears …*" Source: IR 6788-AGCRHD. File status: no response. Master file contains 17 separate IRs recorded
- In response to reported health effects, the MOECC staff noted that the caller was told "We recommend you go and consult with your physician." Source: IR 1564-9GJPA4. No note that this was reported elsewhere in the MOECC.

Sleep deprivation is well known as a factor contributing to illness and also a safety risk for people operating heavy equipment, such as farm machinery, for example. According to one medical journal article,

> "… epidemiological studies suggest that sleep complaints and sleep restriction may be important risk factors for a variety of diseases that are often linked to stress, including cardiovascular diseases and mood disorders."[8] Long-term sleep disturbance is associated with elevated blood pressure, heart attack and heart failure, obesity, diabetes, mental impairment, and increased risk of injury from accidents. [9]

We reviewed the staff notes in both batches of Master Incident Reports for explicit notations of sleep disturbance. *We did not assume* that if people called in the night to report excessive noise that also meant sleep disturbance, though that could be a reasonable assumption. So, the percentage of reports in the 2006–2014 containing staff notes with explicit reference to sleep disturbance was 39%; for the reports provided for the period 2015-2016, the percentage with staff notes referring explicitly to sleep disturbance was 31%. The average rate, then, of express references to sleep disturbances by MOECC staff in the notes made by Provincial Officers was 35%.

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[8] Meerlo P, Sgoifo A, and Suchecki D. 2008. Restricted and disrupted sleep: Effects on autonomic function, neuroendocrine stress systems and stress responsivity. Sleep Medicine Reviews. https://doi.org/10.1016/j.smrv.2007.07.007

[9] U.S. National Institutes of Health. Available at: https://www.nichd.nih.gov/health/topics/sleep/conditioninfo/sleep-deprivation

Again, this is almost certainly only a fraction of the true prevalence of sleep disturbance among the formal reports provided by the public to the MOECC, as most reports provided only scant details about the reasons for the reports. As an example, in one Master Incident Report pertaining to the Unifor turbine in Port Elgin, the staff officer made 52 notes about "health complaints" without being specific or providing any detail about what those complaints were, despite the number of times the person had called.[10]

WHAT MOECC STAFF KNOW

In a separate Freedom of Information request, Wind Concerns Ontario asked to see documents and presentations used for MOECC field staff training, and any documents used in the development of the training materials. [11] This information is important in understanding why staff made the responses they did to complaints in the documents provided by the MOECC. It also indicates a possible disconnect between what field staff are observing and how they may be directed to respond.

In June 2010, for example, information on wind shear and its role in calculating or estimating wind turbine noise emissions was presented to staff of the (then) MOE West Central Region. Wind shear, it was noted, is a critical element in the noise modeling process, which the government as regulator and the wind industry use.

The next set of statements MOECC staff are particularly disturbing.

> *The use of under-estimated wind sheer* [sic] *appears to have influenced the WTG placement process such that they have been located too close to (non-participating), off-site sensitive receptors [ministry code for people's homes] to be operated at their full sound power outputs during certain atmospheric conditions. [12]*
>
> *Initial wind sheer values utilized for approvals purposes were taken to be on the order of 0.15. Field work undertaken by GDO and WCR TSU indicated that wind sheer value was in fact more on the order of 0.3 to 0.4.[13]*
>
> *A re-modeling of the wind turbines utilizing the 2008 guidance document and the more realistic wind sheer indicates the requirement to operate approximately 35 of the 133 turbines in the turbine field in the highest possible noise reduction mode in order to meet the 40 d BA under a number of wind sheer conditions. [14]*

Another factor that is important in assessing noise complaints is the question as to whether the noise perceived is "tonal" or "cyclic." This refers to the fact that sound may be emitted, usually by rotating machinery, in high frequencies in a narrow part of the sound spectrum; tonal or cyclic noise is linked to "annoyance" which is a documented adverse health effect.[15] If tonal noise is detected in wind turbine

[10] Master Incident Report 5833-9AZJKK. Officer signing the report was Kimberly Pietz of the Owen Sound office.
[11] Freedom of Information request A-2017-01697.
[12] WTG Complaint Response and Management, Special Considerations. June 2010, page 7.
[13] Ibid, page 9.
[14] Ibid, page 10. GDO and WCR are Guelph District Office and West Central Region, respectively. The "turbine field" referenced is likely the Melancthon project.
[15] US Environmental Protection Agency, Clean Air Act, Title IV: Noise Pollution.

noise emissions, a 5 d BA penalty is supposed to be applied in evaluating the turbine noise, according to section 359.09 of the Regulations. However, according to this staff document:

> *Long term GDO staff observations of the operation of wind turbines have led Staff to the conclusion that the operation of the turbines is both tonal and cyclic, and as such should be subject to the 5 dB penalty specified in NPC-104. The guidance provided in the October 2008 "Noise Guidelines for Wind Farms"* [government document] *indicates* ***that the wind turbines are not to be treated as tonal or cyclic in nature****.*[16]

Another area in which the staff training presentation appeared to differ from MOECC policy was found in a complaint response document from 2011, and dealt with the capacity to measure noise in situations where there are multiple wind turbines (as is a common situation in Ontario). The presentation stated:

> *MOE EAAB [Branch] has indicated previously (and continues to insist), that there is no "scientifically supportable" methodology to measure field noise emissions from multiple turbine sources at complainant's locations.* [sic]
>
> *EAAB has retained a consultant to develop a methodology for field measurement of multiple turbine noise sources.*

Again, this statement is made five years after the first major wind power project began commercial operation, and two years after the Green Energy Act. In some cases, as for example Cultus-Clear Creek-Frogmore and the Melancthon project, people were exposed to, and complained about, wind turbine noise for years.

Other details covered in the staff training materials included the fact that Ontario's noise regulations were not the strictest in the world, as the Ontario government claims. This provides support for the position many have taken, which is that Ontario's 550-metre setback to protect health and safety is not adequate.[17]

The following statement was surprising; coming in 2011 which was five years after the first wind power project began operation, and two years after the passage of the Green Energy Act which enabled more wind power projects to be developed:

> *There is currently no accepted or recognized provincial procedure for measuring audible wind turbine noise.*

That June 2011 presentation went on to outline problems with measuring noise such as the fact that the protocol at the time called for conditions of no wind, or calm wind, only. [18]

Another presentation, delivered to staff in the fall of 2016, noted that "If the turbines are not audible in any of the recordings, then additional analysis is not required." This direction would mean staff had no foundation for checking for Low Frequency Noise or infrasound, despite indications from citizens that this type of sound was present.[19]

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[16] WTG Complaint Response and Management, page 14.
[17] Wind Turbines, GDO Interim Protocol, February 2011.
[18] Ibid.
[19] Compliance training, Fall 2016.

CURRENT MOECC RESPONSE TO COMPLAINTS

In late 2017, the MOECC's Owen Sound District Manager Rick Chappell was invited to provide updates to the Kincardine Municipal Council and the Multi-Municipal Wind Turbine Working Group on the Ministry's handling of complaints about wind turbine noise.

In his presentations, Chappell indicated that the current MOECC focus is on compliance. Once testing is initiated under the Compliance Audit Protocol, the Ministry does not conduct further testing of wind turbine noise in response to complaints from these projects until the compliance process has reached its conclusion.

The problem with this approach is that *few, if any, projects in Ontario* are known to have successfully completed the compliance audit process to the satisfaction of the MOECC. Enbridge has been engaged in testing and retesting for over eight years and, at the time of Chappell's presentation, the Ministry had not confirmed that their submissions had met the requirements set out in the audit protocol.

The problem with the process is that the old protocol required a large number of readings at various wind speeds and wind companies reported that it was virtually impossible to meet the data capture targets for time periods to be analyzed. The new protocol released in April 2017 relaxed these requirements; many operators of projects in Ontario have rushed to file audit submissions using the new protocol. As a result, according to Chappell, speaking to Council for the Municipality of Kincardine in December 2017, there is a large backlog of audit reports to be assessed in the MOECC department responsible for this process. Chappell told Kincardine Council that the Armow project in the municipality had been submitted in August, but he was unable to advise Council on the status of the review, or even when a decision on its completeness could be expected.

This selective focus on compliance testing is a serious concern as the protocol only covers audible noise and a narrow range of meteorological and turbine operating conditions. The protocol focuses on wind speeds of 4 to 7 metres/second and when the turbines are operating full capacity. This ignores many complaints of excessive noise when wind speeds are outside of these ranges (particularly below 4 m/s) and the noise emissions reported when the wind turbine is ramping up or down.

Complaint response requirements in the approvals issued to wind turbine projects clearly set out requirements for complaint resolution that are *completely separate* from the compliance requirements for audit noise emissions. The MOECC has an obligation to enforce the complaint response requirements of the approval authorities held by the wind power developers/operators.

COMPLAINT FATIGUE

Though the number of formal reports filed with the government remains significant for the 2015–2016 period, it is almost certainly just the "tip of the iceberg" with many people not bothering to complain at all due to lack of trust in the process, or people who have reported noise and other effects in the past but gave up due to the continuing lack of response.

Anecdotal reports to Wind Concerns Ontario revealed several issues:

- In some cases, the people owning the land where turbines are situated were (sometimes formerly) friends, neighbours, even family of those affected by noise emissions, and people did

not want to report on them, even though the reporting process is supposed to be confidential and anonymous[20]

- The MOECC staff in district offices often told people "You're the only one" even though that was not the case, which actively served to discourage further reports.

In the main though, "fatigue" with reporting showed up in many of the Master reports received from the government, and paint a picture of frustration and even desperation on the part of Ontario families. The decline in reporting is clearly linked to MOECC inaction.

In one example, a Master file contained 282 separate Incident Reports, yet had only a single note that staff had called back and left a message. There was no record of further follow-up, or action taken. The report says there was no field response. (IR 7685-9Z4MF8)

A few excerpts of staff notes from Master files:

- "*When a complaint is filed, the noise is allowed to continue … is there any resolution forthcoming? Is the noise protocol set up to actually protect the people?*" MOECC response: "We will not be responding to [complaints] as they do not meet our criteria." This family filed another report 10 months later: "…*we have not recorded a complaint since April due to a lack of action from the MOE to address our concerns though the same issues as reported are still ongoing*." Source IR 1564-9GJPA4
- "[it's the] *same all the time, but if they don't call in everyone will think it is fine but no one does anything*". Staff response is a single boilerplate note to say "night-time modeling shows that noise emissions from the WTGs will be less than 40 dBA at wind speeds less than 6 m/s."
- "*So far you have done nothing to help myself or my family. How many times do complaints have to go into your database before the MOECC will do something about it?*" Response: boilerplate paragraph about lack of resources, file closed, no field response noted. Source: IR 4743-9UVL5M
- "*Another week has passed with no response from you. It has been terrible here off and on the past week … continue to be unable to get a good night sleep …*" And another call: "*When will you reopen our file and help us?*" The caller notes that children are being affected. File marked "closed by ADM" in 2013. File appears to have been reopened but closed again in 2015.

BARRIERS TO RESPONSE

While the general lack of ministry response is telling, so too are some "boilerplate" responses related to why Ministry staff could not act.

Reliance on modeling, not actual noise measurement

> "This is an ongoing issue relative to nighttime wind turbine noise. Area complainants are of the opinion that noise emissions from the various close proximity wind turbines are excessive particularly (and almost exclusively) during the nighttime reduced ambient/background noise

[20] There is a now infamous YouTube video depicting an elderly couple enduring significant shadow flicker so severe it is like strobe lights; their son, who posted the video, added that they will never complain because the turbines affecting them are on their neighbours' land. "My parents have never been complainers," [Matt] Metzgar said. "And they don't wish to be seen as such. They don't have any hope that complaining will get them any results." http://www.chathamdailynews.ca/2017/05/05/dashwood-couples-problem-with-shadow-flicker-raises-ire

periods in the area. Modeling provided to MOECC during the approvals process indicates that noise emissions from the WTGs will be less than 40 dBA at wind speeds less than 6 m/s."

Lack of resources

> "Subsequent to February of 2015 no resources have been made available for any additional after hour WTG compliance monitoring/observation/measurements. Additionally emission and immission audits required by the facility REA despite indicating compliance with the REA have been found to be incomplete at the time of submission. No further action this IR. Suggest close this IR."

Effectively, the MOECC instructed staff not to go to complainants' locations at the time of day the complaint is being made about or at least at nighttime, when many complaints about noise are made. Further, the wind power developers' noise emission audits — required by their Renewable Energy Approvals — were not completed or available, so staff could not check new measurements against prior audits. This situation is a clear violation of the approvals that the Ministry seemed in no hurry to correct.

Focus only on audible noise

The noise protocol contains many flaws, one of which is the fact it focuses only on audible noise, although many of the reports of excessive noise and other effects indicate vibration and sensation. In one case, the caller noted that the vibration had been present for almost a year and was so significant she could see "waves" in her water glass, and she was concerned about cracks in the walls of her house. The Ministry response was: "We can measure sound but no standard is available for vibration." (Source: IR 2721-9U2LR7)

Files closed by supervisors?

Two files in the documents provided for 2015–2016 contained the staff note that the file had been "closed by ADM": there is no explanation of the acronym ADM, which typically means Assistant Deputy Minister.

ONTARIO'S FLAWED NOISE REGULATIONS

Though the Ontario government claims its regulations offer residents the best protection of any jurisdiction in the world, information provided in resident's complaints and assessment by MOECC staff indicate that this is not a valid statement. Gaps in both the tools used to predict the impact of new projects in the approval process and the protocol used to assess the actual noise being experienced by residents were evident; some changes were made over the past two years.

The MOECC was aware that its noise protocol was not adequate as a means of protection for people and the environment. It published a revised version in April 2017, but the protocol for wind turbine noise remains deeply flawed.

In April 2016, new guidelines for evaluating future projects were announced. Most important was revised guidance on the inputs into noise models in response to the findings reported by MOECC field staff when they followed up on the initial complaints. These changes are expected to *increase* the predicted project noise levels at nearby residences by about 2 dBA. The result could be that for many nearby homes, where noise was estimated at 38.1 to 40 dBA under the old rules, the turbines will be out of compliance with the new assessment requirements.

This essentially confirms that many homes in existing projects are exposed to noise above the 40 dBA standard, and provides validation to resident complaints and reports of excessive noise and vibration. So, rather than measuring actual noise levels, the MOECC has continued to dismiss complaints with statements that noise modeling, now acknowledged as flawed, shows that there cannot be excess noise levels experienced at that location.

In a recent example, French wind power developer Boralex just posted the results of a compliance audit, completed for the company by Aercoustics. (Aercoustics is a provider of choice to the wind power industry, regularly preparing noise assessment reports and modeling for applications.) In the Port Ryerse wind power project, an assessment was done on half the turbines operating there, to verify that the noise inputs provided by the turbine manufacturer align with the actual noise generated by the transmission. Aercoustics reported that "… the results of the IEC test at T02 *exceed the maximum sound power level* specified in the Acoustic Assessment Report." The operator "intends to demonstrate compliance," the letter concludes. [21]

It is significant, that the Ministry did not apply its new rules to five projects[22] that had been issued FIT contracts in March 2016 but had not yet submitted their applications, including the noise measurement reports, for review by the Ministry. On January 25, 2018, a community group concerned about one of these projects, supported by three other citizens' groups, announced an application for a judicial review of the decision to not enforce the new standards when the Ministry knows that the old standards were not sufficient to project nearby residents.[23]

In April 2017, the Compliance Protocol For Wind Turbine Noise was also adjusted. This document sets out the procedures to be used by wind companies when doing self-assessment of operating wind turbine projects. While the new protocol acknowledges that wind turbines noise emissions can have a tonal quality continues to focus solely on audible noise, in spite of the fact that acoustics specialists say that is just a part of the spectrum of wind turbine noise emissions. The Council of Canadian Academies, for example, in its report "Understanding the Evidence," noted that current methods of testing wind turbine noise exclude high and low frequencies. "Although A-weighted measurement is an essential method, it may fail to capture the low-frequency components of wind turbine sound." [24]

The Council went on to address another flaw in assessment procedures, which also applies to the Ontario situation: "…measurement is often averaged over time which does not convey changes in sound pressure levels occurring in short periods … time-averaged measurements may thus fail to capture amplitude modulation."[25]

As noted in the documents provided to Wind Concerns Ontario, time and again, people report the sensations of "vibration" and "pressure" which are indications of sound pressure and noise emissions outside the range of audible noise.

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[21] Aercoustics letter to Boralex, January 10, 2018. http://www.boralex.com/cms/uploads/library/files/PRWF%20-%20Emission%20Audit%20Submission%20Cover%20-%202018_01_10.pdf

[22] Eastern Breeze in Nation Township, Nation Rise in North Stormont, Otter Creek in Chatham-Kent and Strong Breeze in Dutton-Dunwich, and Romney Wind in Chatham-Kent.

[23] http://www.cbc.ca/news/canada/ottawa/wind-turbines-ontario-nation-north-stormont-lawsuit-1.4507448

[24] Council of Canadian Academies. 2015. Understanding the Evidence: wind turbine noise, Ottawa. Page xiv.

[25] Ibid.

Also problematic is the fact the new protocol continues to stipulate measurements of wind turbine noise in conditions when speeds are between 4 metres per second (m/s) and 7 m/s. However, the MOECC testing conducted at many properties where complaints originate indicates that the problem turbine noises began when wind speeds were *below* 3 m/s.

In addition, the testing continues to focus on the noise emissions when the turbines are operating at 90% of its maximum sound power level or greater. This requirement remains despite numerous complaints about noise emissions when the turbine is operating at lower power levels or when powering up or powering down.

Clearly, the scope of the conditions covered under the audit tests needs to be expanded, based on real-life experiences being reported by those living among with existing wind turbine projects and expert advice beyond the small group of acousticians employed by the wind industry to conduct these audits. These serious gaps in the protocol caused a Kincardine Councillor to dismiss the whole audit process and requesting that the MOECC focus on address complaints rather than using a flawed process to assess compliance.

ENBRIDGE PROJECT: NINE YEARS OF CITIZEN COMPLAINTS, ZERO RESPONSE

The Enbridge project is particularly noteworthy as an example of MOECC response: the data suggests that the MOECC did not follow up on *any* of the 74 complaints in the two-year period related to the Enbridge project. Taken together with the 442 complaints between 2006 and 2014 reported in the previous FOI request, there have now been more than 500 complaints about that one project.

HURON COUNTY

Huron County saw numerous new wind power projects commence commercial operation during the 2015–2016 period; noise complaints and reports of adverse health effects from residents mounted to the extent that the local health unit launched a public health investigation in the fall of 2017.

In the documents provided, there were 646 formal reports filed with the MOECC for 2015–2016. Again, members of the communities in this area have told Wind Concerns Ontario that they were not given Incident Report numbers, therefore, the records of their reports of excessive noise, vibration and adverse health effects would not have been surrendered in this FOI request.

DEVELOPER/OPERATOR RESPONSE

It is a key requirement of the Renewable Energy Approval or Certificate of Approval that any wind power developer receiving complaints must investigate, take action, and report to the MOECC so that a repeat of the incident causing the report does not happen.

In this group of documents provided, there were comments by residents to the MOECC that the power developers were unresponsive. This is clearly a breach of the terms of the Certificate of Approval.

- *"I tried calling but did not reach anyone … the website for WPD advised to contact SAC* [Spills Action Centre]". Source: IR 6442-ACJLSG

There is also the continuing issue of the failure to produce post-operational emission audit reports that are complete. Again, to the best of our knowledge, at the time of writing, there are few, if any, wind power projects in Ontario with a valid, complete compliance audit, including the Enbridge project near Kincardine, which has been operating for more than eight years.

Staff notes repeatedly refer to this omission, in this group of documents, and in the documents from 2006–2014, in which staff say there are no compliance data to refer to, if noise measurements are taken post-noise complaints. Clearly, the lack of audit reports is being used now by the ministry as an excuse for not following up on noise reports, forcing people into a bizarre hamster-wheel process where nothing is ever resolved.

In the 2015–2016 group of documents, the K2 Wind power project and the Unifor turbine at Port Elgin featured strongly both as a source of resident complaints, but MOECC staff also notes the lack of documentation required as part of the project approval.

"MOECC continues to receive regular, ongoing complaints since operations began in June 2015. Complaints include shadow flicker, turbine and substation transformer noise, infrasound and health. Additional monitoring of residences is planned for the fall. Also, I & E audits required under REA to be submitted due *December 2016*…" Source: 0807-9XKRVJ Status: in progress. Note: there is no complete audit for this project at the time of writing (February 2018)

RECOMMENDATIONS

Based on our analysis of the information released to Wind Concerns Ontario, we present the following recommendations for action.

1. Stop issuing approvals and 'Notices to Proceed' for wind turbine projects.
   - Given the thousands of unresolved noise complaints and the occurrence of "regular, ongoing" reports, **no further projects** should receive Renewable Energy Approval, or be allowed to commence commercial operation. Contracts for projects not yet in operation should be cancelled.

2. Address testing and protocol gaps.
   - Create standards for infrasound and low frequency noise, create usable test procedures to confirm compliance, and equip MOECC staff with proper testing equipment and training
   - Cover the full range of adverse effects generated by wind turbines as demonstrated by the complaints filed with the MOECC

3. Revise incident process to recognize the complainant as MOECC's client and the project operator as the regulated entity.
   - Measure success in terms of complaints resolved, not simply REA compliance; make enforcement process transparent to affected residents and the wider community; and publish annual reports on wind turbine noise complaints with documentation of responses

4. Enforce Approval Terms Related to Complaint Resolution
   - Follow up with project operators to ensure compliance with the approval terms related to resolution of complaints related to adverse effects caused by wind turbines.
   - If operators continue to fail to address complaints, initiate regulatory actions to address the situation.

5. Enforce stronger noise standards using EPA Section 14.
    - Evaluate the full range of noise emissions from wind turbines, move beyond verifying compliance audible noise standards to finding causes of complaints, and address infrasound and low frequency noise complaints;
6. Place an immediate focus on addressing complaints about health issues related to turbine noise
    - The MOECC is the government agency charged with protecting citizens from activities that create environment impacts that have potential to adversely affect health.
    - The large number of independent complaints documented by the Ministry is sufficient to warrant immediate action.

CONCLUSION

Wind Concerns Ontario's position remains that while the government may rely on "modeling" and noise assessments, and contents itself with the unfounded claim that Ontario's setbacks are among the most stringent in the world (which they aren't), the fact is, Ontario citizens continue to report excessive noise, vibration and shadow flicker (strobe effect) together with adverse health effects associated with noise and vibration.

It is time for the government to re-evaluate its policies and guidelines in light of the real-world experiences of Ontario families and make the changes necessary to fulfill the Ministry of the Environment and Climate Change mandate to protect the environment and human health.

Prepared by Wind Concerns Ontario © 2018

*This report is dedicated to the memory of **Stephana Johnston**, a pioneer member of Wind Concerns Ontario, who lived among 18 wind turbines in southwestern Ontario, and who spent her last years sharing her experiences with others and developing learning about health impacts from industrial-scale wind turbine noise emissions, until she was forced from her home. She passed away in January, 2018.*

Sensing but Not Hearing: The Problem of Wind Turbine Noise (Interview with acoustician Steven Cooper, AU)

masterresource.org/windpower-health-effects/sensing-not-hearing-problem-wind-turbine-noise-interview-acoustician-steven-cooper-au

February 2, 2018

Editor Note: **Steven Cooper has advanced our understanding of how people react to real recorded pressure pulsations from industrial wind turbines. In the last six months he has presented eight papers at Acoustic Meetings in Zurich, Boston and New Orleans. With this interview, he breaks down some of the salient points of his research discoveries. Cooper's work is expanding our knowledge about "soundscapes" near projects, which could result in new legal requirements for manufacturers and developers.**

> "In general, wind farm applications claim that turbines do not generate any low-frequency, tonal, or impulsive characteristics, which is a matter disputed by residential receivers. The consequence of the pulsating signal generated by turbines (whether audible or inaudible) could potentially require a further adjustment to any perception or impact generated by wind turbines."
>
> "On discussing the resident's observations (with the residents) for the first two weeks I found the use of describing the impacts in terms of **Noise, Vibration, and Sensation** was accepted by the residents as a better concept."
>
> – Stephen Cooper (below)

Q. Paul Gipe back in his 1995 treatise (*Wind Power Comes of Age*, pp. 371-73): stated, "Next to aesthetic impact, no aspect of wind energy creates more alarm or more debate than noise." He explained in his book how "all wind turbines create unwanted sound" and that sound can carry for great distances. Given this, why, twenty years later, is noise pollution and health effects therein just entering the mainstream?

Cooper:

First, some background. Sound is all around us unless we are in a vacuum. Noise is defined as unwanted sound and has been used as a descriptor by acousticians and authorities for more than 50 years.

'Noise pollution' could be taken as the concept of considering noise overall as being evident and affecting people to various extents with the concept of noise pollution being expressed in the late 1980s possibly more as a side issue to the common concept of air pollution.

Excessive noise or sound that may impact upon a person's health has been well-known for 60-plus years via occupational noise with relevant standards being issued for noise levels in a workplace environment.

With new investigation, the noise criteria applicable to occupational noise has been modified for general factory-type noise and then expanded for different type noises that do not accord with general everyday noise and result in different impacts on people's hearing, i.e. impulsive noise associated with hammering of steel, explosions, or firing of rifles.

In relation to general noise pollution (in terms of mainstream noise), the issue of health effects associated with road traffic noise, rail-traffic noise and aircraft noise entered mainstream issues before the 1995 extract that you have quoted. The general concept in terms of ascertaining appropriate **noise limits** for those types of noise involve community surveys and socio-acoustic studies to derive a dose-response curve where a noise limit was set to ensure that 90% of the population was not subject to an excessive degree of noise (with respect to annoyance) for 90% of the time.

With respect to wind turbine noise, in the mid-1990s the provision of wind turbines in rural communities came to the fore with respect to unwanted noise. Clearly the noise generated by such turbines was totally different to that of the existing environment. Whilst persons in proximity to wind turbines identified annoyance and sleep disturbance in mainstream acoustics, the number of people so affected is a small proportion of the total population and therefore did not warrant socio-acoustic studies.

If in the general sense the impact of turbines is limited to a small area around a wind farm (when compared with the total area of a regional county or the state) then the environmental authorities do not consider it to be a significant issue warranting further investigation.

Material conducted in relation to community response to wind turbines in Sweden and the Netherlands identified a dose-response curve significantly lower than that for road, rail or aircraft noise and suggested the appropriate limits for wind turbine should be significantly lower. However, that work related to relatively small turbines and an increase in the capacity of turbines to those which exist today results in a greater level of noise emitted from turbines.

Environmental authorities, encouraged by the wind industry, utilize noise criteria for turbines based upon road-traffic noise, notwithstanding the two noises are not the same.

The WHO 2009 European night-time noise guidelines identifies that ongoing noise disturbance, particularly with respect to sleep disturbance can lead to health impacts. It is necessary to note that most of the noise data contained in the 2009 guidelines relates to road traffic noise in urban areas. There is no data contained in the study related to wind turbines.

The various WHO guidelines that have been published identify where a noise contains a dominant low-frequency component then a further penalty should be added to any assessment criteria. Similarly, if a noise contains an impulsive characteristic then a further penalty should apply.

In general, wind farm applications claim that turbines do not generate any low-frequency, tonal, or impulsive characteristics, which is a matter disputed by residential receivers.

The consequence of the pulsating signal generated by turbines (whether audible or inaudible) could potentially require a further adjustment to any perception or impact generated by wind turbines.

In general, the noise criteria specified for wind turbine facilities is related to external noise levels, not internal noise levels. The spectrum of wind turbine noise can often be masked by external noise sources at an external location. But when assessed inside the dwelling, the reduction in sound provided by the building envelope dramatically reduces the high frequency components of both the external noise and the wind turbine noise, leading to a totally different spectral balance of the sound inside the dwelling that can make the audible characteristics of such turbines more apparent.

Q. How long have you been researching noise, vibration, sound, ILFN (Infra and Low Frequency Noise), and now, pressure pulsations, from industrial wind? How did you become interested in this?

A. I have been an acoustic engineer for 39 years and had a basic grounding in large scale industrial plants then helicopter and aircraft noise. I am involved in development applications for different types of projects and provided expert evidence on acoustic matters, primarily before planning courts.

In 2012, I was asked to review a proposed wind farm application and found a lack of evidence for the basis of the acoustic criteria that was proposed. The level of disturbance reported by residents in proximity to existing wind farms contradicted the acoustic material supporting the application.

Based on previous investigations of noise complaints one needs to take on board complaints in the investigation. This led to me requesting access to several residences in proximity to an operational wind farm. My attendance and measurements found the presence of noise levels significantly greater than predicted and a unique signature subsequently found near other wind farms.

Since 2012 I have been involved in seeking to identify and quantify the acoustic signature associated with wind turbines so as to permit the necessary medical investigations to be undertaken by others.

Q.Your interviews and studies at homes of impacted persons at Cape Bridgewater are groundbreaking. Can you describe the creative process involved in your discoveries? In what way was this study/research so important?

A. On previous testing at the Waterloo wind farm I found residents could identify pulsations from the wind farm even though it could not be heard. It was something they felt rather than heard. The wind farm could be sensed when the narrow band frequencies around 4 – 5 Hz had a level in the order of 50 dB (or more).

I was subsequently approached by the operator of the Cape Bridgewater wind farm to undertake an investigation to address complaints from local residents that could not be resolved by the dBA method and was given a free hand to undertake testing to explore the concepts I had presented to describe wind turbine noise impacts.

I was given a brief to undertake measurements and determine certain wind speed and noise levels that corresponded to complaints from specific local residents. The conduct of medical studies at the same time and have a control group was refused by the wind farm operator.

I based the study on the complaints and observations by the residents for comparison with the measurement results. I took the view that the primary function was to take account of the resident's observations without ANY preconceived opinions.

I took measurements inside and outside residential dwellings and was given access to the wind farm and all operating data over a 9-week period.

I was to attend the site every two weeks to download data and meet with the residents (a house at a time) to discuss the analysis of the previous fortnight and what they had reported. We processed the diaries and the data separately to each other, then combined the results for discussion.

I trialed a diary format based upon the EPA Waterloo study to see if I could match the results. But the residents couldn't agree with the noise descriptions.

On discussing the resident's observations (with the residents) for the first two weeks I found the use of describing the impacts in terms of **Noise, Vibration, and Sensation** was accepted by the residents as a better concept.

The challenge we had was finding a way to identify a pattern in the complaints versus the operation of the wind farm. I work best in a visual format and we tried various permutations of graphical tracking of the results versus the dBA levels, the power outputs of the wind farm and the wind speed and direction.

Initially I found a pattern versus changes in the wind farm power output as the residents were only reporting changes that they perceived. I changed the reporting to 1 or 2 hourly intervals.

Based on the complaints we found certain wind speeds (power outputs) that gave rise to complaints. The challenge was then finding the sound levels that related to complaints.

dBA doesn't work. We found it correlated well with the wind speed but not with the noise from the wind farm.

We then tried 1/3 octave bands and various acoustic parameters that have been used for noise and wind farm investigations and still no trend.

It was not until we tried the complaints versus the infrasound narrow band signature that we found a trend. *And sensation came out as the major impact.*

We tried plotting the greatest level of sensation (when the residents actually left their properties or wanted to leave) and found patterns of disturbance that related to the power output of the turbines trying to start, when at high wind settings that the blades were angled to depower the turbine or changes in the power output (up or down) of over 10%.

I also noted intermittent vibrations in the floor of house 88, even during the shutdown period, that related to wind gusts. This led to vibration measurements on some turbines and in the ground on the wind farm and the residences.We have since used the Cape Bridgewater data for further testing and research.

Q. How did you convince the developers at Cape Bridgewater to turn off the turbines for your control/blind study?

A. They were trying to get the testing done before or after the planned shutdown. The shutdown was to facilitate high voltage cabling at the substation and would occur on ten days with the wind farm operating at night. I convinced them that having testing during the shutdown would be an essential part of satisfying the brief as we could see if there were complaints without the wind turbines – and get the true ambient background noise levels without any power to the turbines.

It became an essential part of the study in that it clearly showed the different acoustic signature with and without the turbines operating, that the natural environment did not have a discrete infrasound signature and that wind gusts did excite resonances of the turbines, both in terms of noise and ground vibration.

Q. What recent papers have you presented, where, and about what? We understand that you are changing the language around “noise” and wind turbine effects possibly with the eventual understanding for legislators and policy makers.

A. The Cape Bridgewater study revealed further investigations were required as the scope of the study was limited by the wind farm operator and as such was called a pilot study.

I was invited by Dr. Paul Schomer to be a member of the Acoustical Society of America Wind Turbine Working Group to discuss further investigations of wind turbine noise. The group has had sessions at the last six ASA meetings with the opportunity to present papers on the topic. I have now given 14 presentations on my on-going research into wind turbine noise.

On the technical side we have developed a graphical presentation (a movie) for showing the variation in the acoustical signature that conveys a number of concepts in the time and frequency variations of the signal. I have raised the issue of sample speed and the error in using a digital simulation rather than the original wave file recordings.

Using a digital equivalent of a time average narrow band analysis of a wind turbine signal is not the same as the original signal. Whilst having the same energy content if used for subjective testing, it is dramatically dissimilar as identified in Annex D of ANSI Standard S12.9-2016/Part 7; but this seems to be conveniently ignored by some people.

Using inaudible digitized energy equivalent signals restricted to just infrasound can only give rise to a conclusion of nothing being heard/detected. Or, using an inaudible single tone at 4 or 9 Hz and saying it is wind turbine infrasound, is completely wrong.

We modified our reverberation chamber to investigate the threshold of perception versus the threshold of hearing in the infrasound region. Headphones don't work the same as immersing the body to the sound field. We investigated the reproduction of the wind turbine signals normal sound and infrasound in our chamber with a large baffle of speakers to find the limits of reproducing the signal.

This is where the issue of sensation comes into play. If the residents cannot hear the turbines yet they can sense them, then the Leventhall mantra of "what you can't hear cannot hurt you," is incorrect.

As in many cases residents can perceive the operation of the turbines even though they cannot hear them, we first worked on the threshold of perception of infrasound versus the threshold of hearing in one of our test chambers. The perception occurs below the threshold of hearing and has a hysteresis effect in that the thresholds are different when the levels is increased (from inaudibility) compared to going down.

I have questioned what makes up the acoustic signature or the mechanism that gives the infrasound signature. The accuracy of the analysis and whether the turbines generate infrasound and sound waves (like that of a tuning fork), or whether there was a pulsation of the sound occurring at an infrasound rate based upon the blade passing frequency. This is the number of times a blade passes a fixed point (say the tower). For a three-bladed turbine operating at 17 rpm this gives 3 X 17 = 51 times a minute or 51/60 = 0.85 Hz.

There have been a series of papers on that subject and the ability to accurately reproduce the signal in a laboratory.

We have found there are issues with the mathematics of the analysis as the signals are not sine waves, but pulses that vary in their level over time due to different loadings on the turbines and interaction of multiple turbines.

We have identified several researchers who have used digitized infrasound signals, claiming that they are actual wind turbine infrasound, to lead to the conclusion of a nocebo effect. We have tried that approach and when increasing the gain to be audible and/or speeding up the signals into the audio range they sound totally different. Why not use the recorded wave files? Why go through a process of converting the signal into a modified digital signal that is not the same?

We looked at the subjective evaluation of wind turbine noise and the issue of amplitude modulation. We found audible and inaudible modulation and that the use of stereo imaging to give (in all cases) an overwhelming preference by the test subjects when compared to a mono signal. This outcome is obvious if you go and listen to wind turbines. However, there are

papers on wind turbine subjective assessment based upon mono signals. The papers presented over the last 12 months have focused on those issues and the accuracy of reproducing the test signal from wave files recorded on site.

The question of the perception of inaudible wind turbine noise was investigated for the first paper given in New Orleans last month. It seems nobody else has undertaken such an exercise and we were able to show that persons sensitized to wind turbine noise could identify the operation of the test signal even though it was completely inaudible.

Q. The “sensing but not hearing” may be oblique to some. Can you explain the process and effects on the whole person, from the unique pressure pulsing of industrial wind turbines?

A. In 2013, monitoring at the Waterloo wind farm at a number of different houses found that residents could identify the operation of the turbines at certain times and not at others. I was unable to hear the turbines, but by viewing the narrowband frequency spectrum covering the infrasound region the analyzer showed discrete frequencies associated with the blade pass frequency (the number of times a turbine blade would pass a fixed position in a second) and multiple harmonics of that frequency.

I observed that when the levels of the frequencies around 4 to 5 Hz exceeded 50 dB then there was a very good correlation with the perception of the operation of the turbines. However, such levels of noise at those frequencies are deemed to be inaudible.

What I asked residents to do, whilst I was undertaking measurements, was to simply use their hand to identify the pulsations that they could detect such that the hand moved in time with those pulsations.

This led to the concept of sensation and by communication with colleagues in America as to the limits where the perception of the operation the turbines occurred led to the rediscovery of the work in 1980 by Dr Kelley.

When I tried the diary concept for the Cape Bridgewater residents I utilized the South Australian EPA’s diary format from the Waterloo study to find that the residents did not fully comprehend or agree with the diary because the descriptions associated with noise were not necessarily satisfying what the residents were detecting. I then suggested the concept of something that they sensed rather than heard or felt by tactile vibration as another descriptor that could be used. This sensing involved pressure in the head, in the throat, in the chest, feeling dizzy, feeling lightheaded, a tingling in the legs, **whatever sensation they experienced which could not be explained by something that they were hearing or a vibration that they were feeling.**

(Our note: See here for a previous article at MR regarding the Cape Bridgewater findings.)

All the residents involved in the Cape Bridgewater study agreed that the concept of sensation was more appropriate in describing what they were experiencing, and that in many cases what they had complained about as noise impacts was incorrect and was the wrong description.

When describing the concept of sensation to other people that are exposed to wind turbine noise I have received confirmation that, yes, sensation is the appropriate mechanism for describing what they are experiencing.

As described earlier, the operation of a turbine generates pulses at the blade pass frequency. Due to there being different wind speeds at different elevations above the ground then the pressure differential across a blade at the top of the swept path is different to that at the bottom. Accordingly, along the length of the blade one can imagine the windspeed and the pressure differential across the entire length of the blade will vary as the blade rotates.

For example, for a three-bladed turbine that is operating at 17 revolutions per minute, then for any fixed point on the circumference of the swept path of the blades there will be 3 x 17 = 51 passes per minute. Because acousticians work in Hertz or cycles per second, then the blade pass frequency is 51/60 = 0.85 Hz.

As frequency is the reciprocal of the timing between the pulses a blade pass frequency of 0.85 Hz means that there is a pulse every 1.177 seconds.

One only needs to listen to operational turbines to observe that the nature of the acoustic emissions generated by turbines is not one of a constant noise. One can hear the regular pattern of the swish noise which occurs at the blade pass frequency.

Spend some time at a turbine and it becomes apparent that the overall noise varies up-and-down in its level due to the different wind speeds. The character of the noise may vary in a matter of minutes due to a significant variation in the level of the noise (the amplitude) where that variation changes at the rate of the blade pass frequency.

If you examine the frequency spectrum you will find that the variations in the amplitude and the pulsations that occur affect all the frequencies across the audible range and occur below the nominal threshold of hearing which means that there are inaudible pulsating signals.

The natural environment where there are low frequency and infrasound signals generated by the wind, waves on the beach, waterfalls etc. do not exhibit this unique periodic function of a blade pass frequency, and harmonics of that frequency. This permits one to simply use the narrowband infrasound analysis to identify the operation of a turbine.

Many residents report unexplained disturbance or impacts when they are unable to hear the turbines but can identify the operation of the turbines by way of what they sense; that led me to undertake the latest research by creating inaudible wind turbine noise as recorded inside houses and then subjecting people to that noise.

As an acoustic engineer with years of investigating industrial noise complaints and complaints from the community concerning, in particular music from licensed premises, the important thing in considering impacts from any noise source is listening to the complaints, conducting measurements and observations with an open mind and then seeing if there is any relationship between those three inputs in addressing the problem.

That is the approach that I adopted in trying to understand what were the complaints from residents associated with wind turbines when on my first experience the noise was extremely low, could not be detected inside the dwelling and I didn't understand why the residents would be so vocal and genuinely distressed from the turbines.

Now I am summarizing in a relatively short space of time the result of four years of research work into what constitutes the acoustic signal from wind turbines and investigating the limitations in producing such signals. This work has been the subject of 14 presentations/papers presented to the Wind Turbine Working Group of the Acoustical Society of America. It has been a long and frustrating process to identify how to reproduce the original signal in a laboratory (and more importantly what doesn't work) that has questioned and debated what is the actual acoustic signature associated with turbines, and are we correctly measuring those signals?

Chapters 9 and 10 of the Cape Bridgewater report identified by way of the specific on-off testing of the entire wind farm the unique signature that is associated with wind turbines, and I understand that is the first time that multiple simultaneous measurements repeated on a number of occasions with turning off entirely a wind farm that this material has been obtained. A stopped wind turbine/wind farm generally still has equipment operating inside the turbines such as pumps and fans et cetera operating that in turn can radiate noise from the turbine tower and effect the "off" results, which was the case under the EPA Waterloo study.

Q. What triggers are there for sensitive or sensitized persons? Do you plan more research on specifics of these (possibly PTSD impacts)?

A. I am just a noise engineer and therefore not qualified to answer that question in terms of how the body responds to different acoustic stimuli.

What we have found is that we can present to people inaudible wind turbine noise and get a reaction whilst we can provide inaudible road traffic noise or wind noise similar levels or for that matter constant tones and not get any reaction.

We were investigating noise complaints associated with an underground coal mine that has a very large ventilation exhaust fan with an operating speed well down in the infrasound region and was subject to some level of pulsation. In an audible sense that a kilometer from the discharge point one could hear a low frequency noise around 120 Hz that over a very slow rate the amplitude of that noise would vary.

When the family that was the subject of the investigations attended our laboratory, and was exposed to a constant level and 120 Hz (pure tone) at about 50 dB there were no issues. That level of sound is clearly audible. However, when we sought to turn the volume control up and down on a repeated basis the residents noticed a difference. As we slowed the rate of turning the volume control up-and-down the sound became more disturbing, and when we attained a rate of about two seconds, the family felt very uncomfortable and left the test room.

This material was reported to the Wind Turbine Working Group at the Salt Lake meeting in May 2016 together with a movie concept that we had developed showing the variation in amplitude and frequency of the original source signal to have the acousticians immediately recognizing relationships to motion sickness.

Normally people look at the physical movement of the body in terms of vibration as to motion sickness but there was no physical movement of the body but simply a pressure wave to the body and the head which is one issue that raises the question of trigger that you have expressed.

In the Wind Turbine Working Group meeting in Hawaii in December 2016 I raise the issue of the **startle reflex,** and whether one needed to consider the holistic effect of noise vibration and tactile perception which could incorporate the entire body.

We found that residents in proximity of a coal-fired power station (15 – 30 km) experienced significant sleep disturbance when the power station was operating at low fire rates, in a run up or run down when they obtained about a 25% capacity, or if the two turbines when operating the maximum capacity had a difference of about 10 MW. Examination of the signatures during that time indicated that the 50 Hz mains frequency was subject to variation and an infrasound rate, pulsations.

It would seem that my work has shown that inaudible pulsating noise can create impacts. As such it would appear that I have provided some validation of a hypothesis provided by Dr. Nina Pierpont in 2009.

> "Wind Turbine Syndrome, I propose, is mediated by the vestibular system—by disturbed sensory input to eyes, inner ears, and stretch and pressure receptors in a variety of body locations. These feed back neurologically onto a person's sense of position and motion in space, which is in turn connected in multiple ways to brain functions as disparate as spatial memory and anxiety. Several lines of evidence suggest that the amplitude (power or intensity) of low frequency noise and vibration needed to create these effects may be even lower than the auditory threshold at the same low frequencies. Re-stating this, it appears that even low frequency noise or vibration too weak to hear can still stimulate the human vestibular system, opening the door for the symptoms I call Wind Turbine Syndrome." Pierpont 2009

In 2012, from my initial analysis and investigations of complaints in relation to wind facilities, I was of the view that we needed to identify the acoustic signature associated with operational wind turbines, and only when that signature had been identified and able to be reproduced, could you then move to the next stage, which would allow the medical investigations into wind turbine noise.

The problem that existed in 2012 was that there be no medical studies to identify the impacts of wind turbine noise (a common statement from the wind industry). However, there is equally the same position that there are no medical studies to identify that there are no impacts from wind turbine noise.

On a statistical basis whilst adverse impacts attributed to wind turbines represent a small proportion of the community, the proportion of the community affected is more than a background proportion and indicates that there is a statistical anomaly that supports a problem.

For the people who are adversely affected by wind turbines to the extent that it affects their daily lives and in extreme cases causes them to abandon their homes, it is clearly a problem. If one restricts the catchment area for a community to be within 10 km of a wind farm (and not as in some studies, consider the community out to 100 km away), then on the restricted catchment area on a statistical basis there is a high proportion of the community being affected.

Where do we go from here? It seems we have a facility that can faithfully reproduce various acoustic signals across the audible frequency range and in a limited capacity we can reproduce infrasound levels in a test environment. We are presently exploring better quality digital to analog converters to overcome some technical limitations.

With our recent pilot study results if funding can be provided we would seek to rerun the study but with say 50 test subjects who are being sensitized to wind turbine noise but at the same time we would have appropriately qualified people undertake medical monitoring of the test subjects including EEG monitoring. We would not only just examine wind turbine noise, but we would compare the general environmental noise (also inaudible) that is often used as a comparison to wind turbine environments.

Q. Why are some persons near projects impacted, and others less so? Is it possible that some are impacted without knowing it long term? If so, what might those health impacts be?

A. In 2015 I presented a paper to the Wind Turbine Working Group of the Acoustical Society of America where I raised the matter of **'sensitization over time.'**

Over the last six years I have attended various wind farms on a number of occasions as part of my research work an investigation into wind turbine noise. I have met residents and have stayed at their houses several times over the years; it seems to me as a general observation that the people become more sensitized to the operation the turbines in that they are able to detect the operations at a lower level than previously, and that in the number of households more members of the household have been able to detect sensations or were being impacted by the turbines than on previous site visits.

The residents report a greater sleep disturbance over time and more people have had to abandon their homes.

For some people when abandoning their homes and residing at other locations there is an improvement in their overall demeanor and well-being and from my observations their conversation appears to be more normal and not exhibiting (to me) signs of depression.

However, for some people there are still lingering issues of impacts and the degree of sensitization that has developed has become affected by other “normal” noise sources such as traffic.

At the New Orleans Wind Turbine Working Group meeting Melissa Ware (who has a hearing impairment and was one of the participants in the Cape Bridgewater study) presented how she has been impacted because of the turbines.

Figure 4.3 of the WHO 2009 European night-time guidelines identifies how ongoing noise disturbance can lead to health impacts and cites cardiovascular disease as one possible outcome. The WHO discussion in Chapter 4 in relation to health impacts, primarily related to road traffic and aircraft noise, should be placed in the context of the suggested dose response curves to indicate impacts from wind turbine noise occurs at lower thresholds than that of Road Traffic or Aircraft Noise.

Q. You have testified in many instances, in various countries, about these findings, and the very real and verified impacts on “victims.” Have these testimonies had impact on policy changes?

A. The wind industry relies upon compliance with guidelines or criteria issued by regulatory authorities.

In many cases the court relies upon guidelines or criteria issued by regulatory authorities, despite hearing evidence from residents as to the extent of disturbance they experience because of operating wind turbines.

In the end the court or tribunal uses the escape clause that it is not for them to set guidelines or criteria, but it is the regulatory authorities responsibility and therefore they must abide by that criteria.

So, to date there have been no policy changes as a result of my investigations or the many “victims’” impact statements to Courts and Tribunals. The escape clause is the published guidelines and standards.

When one examines the guidelines or standards used in Australia for wind turbines, it becomes obvious that there is no scientific basis to identify the noise targets proposed for wind farm facilities with respect to an acceptable level of noise that will not give rise to disturbance or unacceptable impacts for residents.

This fact is obvious because there are no scientific studies into determining the dose-response curve to identify the level of annoyance that would satisfy 90% of the population or to identify the level of noise from wind turbines that would not give rise to sleep disturbance.

The regulatory authorities are the ones who should be accountable to the community for permitting adverse impacts and in turn health impacts.

Policy change in terms of guidelines and standards for wind turbines in Australia, or in America, will simply not occur if left to the regulatory authorities. For example, the community of Waterloo in South Australia have publicly expressed no confidence in the South Australian EPA who steadfastly support their guidelines as being appropriate, without providing any material to support the basis of those guidelines other than simply referring to WHO guidelines (based upon road and air traffic).

With the mounting evidence of the negative impacts created by wind turbines, and if one can get to the point of the medical studies to confirm the actual impacts, then one could expect damages claims against the regulatory authorities for their lack of scientific rigor and failure to apply the precautionary principle.

In late last year, the Administrative Appeals Tribunal (a federal Judicial body) in relation to the charity status of the Waubra Foundation, was presented with a significant degree of evidence in relation to wind turbines creating adverse impacts on the community and the inadequacy of current guidelines to protect the community.

The Waubra Foundation has assisted members of the community in seeking to understand the ramifications of wind turbines and to be in effect the first point of contact to obtain information or advice in relation to wind turbines.

The foundation lost its charity status, but it is of huge significance that the Administrative Appeals Tribunal clearly stated that dBA was useless. *The AAT found that the operation of wind turbines did generate both audible and inaudible sound, did create an impact on the community that gave rise to disturbance and that more research (to that proposed and supported by the Waubra Foundation) should be undertaken.*

The week following the AAT decision, five papers from Australians were presented to the ASA Wind Turbine Working Group, of which the first paper was my recent one concerning the pilot study of inaudible wind turbine noise being detected by residents who are sensitized to wind turbine noise.

Q. In your response to the previous question you referred to the need for appropriate criteria for wind turbines and noted that there are **'no criteria** based upon wind turbine studies.' Some people say the Health Canada study provided that information. What is your view of that study?

A. I am unable to comment on the socio-acoustics or the medical components of the study, but understand there has been significant criticism of the Health Canada study by persons appropriately qualified in those areas. Master Resource has published some of those; other criticisms are listed here.

The authors of the Health Canada study identified that it was only site specific and should not be used as generic conclusions.

The study had limitations on the age of people involved in the study and left out houses that were vacant. Community representatives have identified that a high proportion of the vacant houses related to people who had left the area (abandoned their homes) because of the wind turbines.

The ASA Wind Turbine Working Group (Acoustical Society of America) was advised in the middle of last year that there would be an investigation undertaken by Health Canada in conjunction with the community to look at the people who are sensitized to wind turbines and/or who had abandoned their homes, but that material has not been published.

The determination of the actual noise from wind turbines when utilizing the dB(A) or the dB(C) parameter is difficult in the real-world environment, which is the position that we found in the Cape Bridgewater study.

A problem with the Health Canada study is the lack of actual acoustic or measurements to relate to the community response material in that the **study relied upon predicted noise levels** and not actual noise levels. As such the Health Canada study did not (and could not) provide any validation of the predicted levels versus the actual wind turbine noise levels.

The analysis to show a constant 15 dB difference between dB(A) and dB(C) is simply from a mathematical analysis of distance attenuation using a constant spectrum without any adjustment for excess attenuation over distance due to atmospheric absorption and this can only relate to a theoretical exercise for external noise. Due to the attenuation characteristics of different building envelopes, the internal noise level from wind turbines cannot be simply extrapolated from an external noise level, and this is an issue of concern.

The interpretation of annoyance excessive to background levels as published by the principal author of the Health Canada study, simply defies logic as to what it means and ends up contradicting other acoustic components of the study.

Some of the ambient noise levels that have been provided in the Health Canada study seen to be extraordinarily high if one is considering a rural environment. Yet there is no information to identify the nature of the acoustic environment and the influence of agricultural activities or traffic noise that may have required some of those data points to be removed.

The study appeared to be constructed around existing general acoustic criteria and other than some excellent work in terms of infrasound monitoring (then reported upon by others), there does not appear to have been an attempt to undertake a lateral thinking approach in looking at other indices or issues that may be giving rise to the reported disturbances.

Q. It seems that the primary complaint that first occurs with wind turbines is sleep disturbance. The WHO 2009 European Night Time Guidelines show in Figure 4.3 that on-going sleep disturbance becomes a health impact. The WHO reports that some of these, by no means the exhaustive list, are attributable to poor sleep patterns, often a result of environmental noise:

fatigue, lack of ability to concentrate, memory impairment, lack of energy, proneness to errors or accidents, tension, social or vocational dysfunction, headaches, and gastrointestinal symptoms related to worry about sleep.

In your opinion is sleep disturbance from wind turbines a relevant matter that should be investigated?

A. Most definitely YES.

If we have guidelines or standards that claim they have criteria to protect against sleep disturbance or identify the sleep disturbance is an adverse impact, or criteria that purport to protect the amenity of the surrounding community from adverse noise impacts then surely there must be some data to substantiate the criteria that have been nominated for wind turbines.

However, I have yet to see any material/data that relates to the current capacity of wind turbines being installed around the world. A few papers related to studies at the beginning of this century in Sweden and the Netherlands on relatively small wind turbines, indicated dose response curves significantly lower than that applicable to road traffic noise (in urban areas) or aircraft noise.

Wind turbines are generally located in rural areas then the acoustic environment of rural areas, and therefore the identification of the acoustic amenity that residents in those areas experience must be different to that in an urban environment.

From my investigations and examination of various studies into wind turbine noise, it seems to me that the following questions need to be answered by the Regulatory Authorities in relation to the criteria that those authorities have issued to permit wind turbines to operate in proximity to residential receivers. It does not hurt to repeat these, if some have not understood the basic nature of these requests for sources and studies.

1. > Please provide studies upon which the wind turbine/farm criteria have been developed?
2. > Please identify the noise source(s) that have been used in the studies related to question 1?
3. > Please provide the dose-response data related to wind turbine/farms on which the criteria are based, and the corresponding level that represents 10% of the population that is highly affected?
4. > The most common complaint from residents relates to sleep disturbance. Please provide the studies of wind farm noise that identifies the noise (in any relevant acoustic index) that gives rise to sleep disturbance?
5. > Please provide studies of wind farm noise that identify the noise level (in any relevant acoustic index) that will not give rise to sleep disturbance.

6. > Please provide studies of wind farm noise that identifies the noise level that would protect the acoustic amenity of residents in proximity to wind farms.

7. > In light of the above, please identify who would be liable (in a damages claim) for the consequences of adverse impacts.

I came up with the above questions in December 2016 and to date, neither I nor community representatives in Australia have been able to get any response from the regulatory authorities or a Commonwealth Government appointed Wind Farm Commissioner to these relatively simple questions.

Those same questions were put to the Administrative Appeals Tribunal, but they were unable to answer those questions simply because the data is not available.

The provision of scientific data to identify the dose-response curve and sleep disturbance criteria in relation to wind turbine noise would then place in context the appropriateness or otherwise of criteria issued by Regulatory Authorities.

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We thank Steven Cooper for his detailed and extremely current exploration and overview of wind turbine “noise” and again, his studied reminders of the profound relationship between sleep and health. As Mr. Cooper indicates yet again, let developers or wind promoters provide the dose response curve for sleep disturbance, provide all the data that should be tabled, in full protection of human health, before contemplating building wind factories.

Subjective perception of wind turbine noise - The stereo approach

Steven Edwin Cooper, and Chris Chan

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Subjective perception of wind turbine noise - The stereo approach

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The conduct of stereo measurements for both playback in high-quality headphones and in a hemi-anechoic room has been undertaken for a number of wind farms and other low-frequency noise sources as an expansion of the material previously presented at the Boston ASA meeting. The results of the additional monitoring, evaluation, and subjective analysis of this procedure are discussed and identifies the benefits of monitoring noise complaints and assessments of wind farm noise in stereo. The laboratory mono subjective system was used to reproduce the audio wave file obtained in a dwelling. The test signal, being inaudible, was presented as a pilot double blind provocation case control study to 9 test subjects who have been identified as being sensitized to wind turbine noise and low frequency pulsating industrial noise. All test subjects could detect the operation of the inaudible test signal. The use of a stereo manikin to investigate detected inaudible ”hotspots” is discussed.

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1.0 INTRODUCTION

The subjective assessment of wind turbine noise, and in particular the perception of amplitude modulation, have been undertaken using a mono noise source that may be generated by multiple speakers mounted on a baffle [1], [2] or use of a three-sided speaker located in a corner of the room as an extension to the use of that speaker for the generation of synthesised infrasound [3], where in the main the source being reproduced is an external signal.

Reproduction of an internal signal has tended to use a synthesised signal (rather than an actual signal recorded inside a dwelling) with an assumption of building attenuation and disregarding the influence of room mode or building element resonances.

In relation to the accurate reproduction of wind farm noise over the infrasound region and the low frequency region the use of actual wave files is preferred, once one overcomes the technical challenges that are presented [4].

Having conducted measurements and assessments at residential premises in proximity to wind farms, on a subjective basis our experiments have found a significant difference on comparing the reproduced signals to the actual sound of wind turbines observed in the field.

Our previous paper on this topic presented at the Boston ASA meeting [5] identified an overwhelming support by test subjects for the use of stereo recordings for the subjective evaluation of external wind turbine noise.

The use of line array speakers in a hemi-anechoic room for a mono signal (from a precision sound level meter) versus a stereo signal from precision microphones set 1.9 m apart found a dramatic difference in the perception of external wind turbine noise. For the test subjects that have experienced the comparison there is 100% agreement that one must use stereo assessment for subjective assessment of wind turbine noise and in particular when evaluating special audible characteristics.

Further evaluation of special audible characteristics and/or subjective assessment of wind turbine noise has been undertaken using headphones with a frequency response of 4Hz – 45 kHz [6] and a D Class amplifier. The previous presentation postulated the concept of using manikins to be superior to two microphones orientated 180° apart (back to back). The principal basis of the hypothesis was the omni-directional characteristics of precision microphones versus the directional characteristics that occur for humans (and manikins), due to the attenuation of the head with respect to the individual ears/microphones.

Having an individual in a stationary position whilst listening to a person moving 360° around that individual, and continuously talking with the speaker's mouth oriented towards the listener is a simple method to identify the difference in the sound that an individual hears where that sound comes from different directions.

2.0 OBTAINING THE STEREO SOUND FIELD

The cost of professional head and torso systems used for the acoustic evaluation of headphones or room acoustics [7] is not one that lends itself to fieldwork with respect to unfunded investigations.

A cost-effective solution utilised hollow manikins with Type 1 precision microphones mounted in each pinna, utilising a microphone extension rod from older precision sound level meters (rather than an expensive 90° adapter), with preamplifiers on the end of each extension rod, is a practical solution (see Figures 1 & 2).

Field testing was undertaken of microphone set ups using two microphones spaced 1.9 m apart pointed directly towards the noise source, two microphones in line but 180° apart and parallel to the wavefront from the noise source of the investigation, and the stereo manikin concept identified in Figure 1. In all cases the microphones used are GRAS 40AZ with B & K 2669 preamps to a LANXI multichannel Pulse System with a sample recording rate of 113 kHz per second. The stereo wave file signals were compared directly with a wave file from a B & K 2250 Sound Level Meter using a B & K 4193 microphone. All system combinations permit full-spectrum monitoring down to and including the infrasound region.

Comparison of the stereo measurements versus the single mono channel measurement have for every test subject found the stereo material (when compared to mono) to be superior whether utilising speakers or headphones.

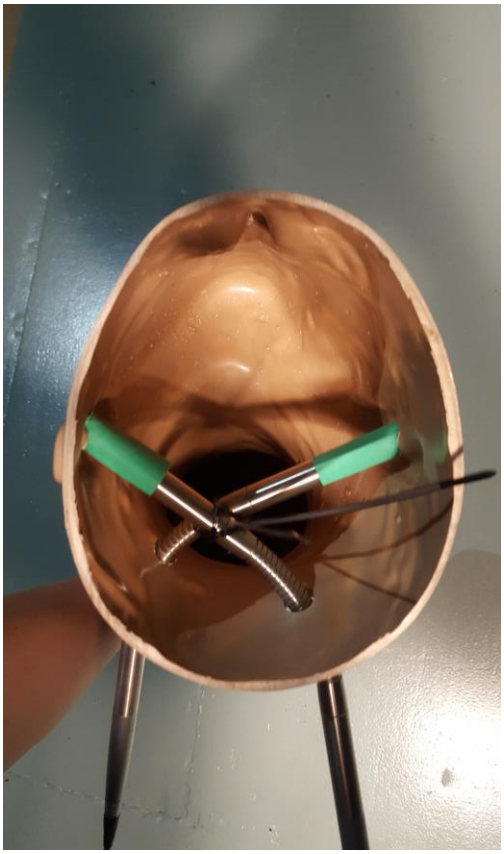


Figure 1 View of Microphone set up

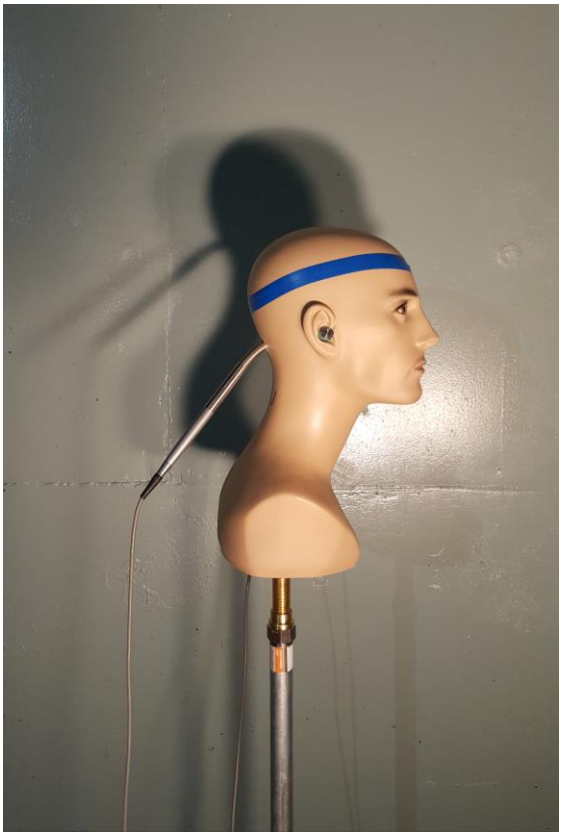


Figure 2 Manikin mic in ear and preamp on extension rods

Utilising the headphones for playback, the manikin measurements were found in the opinion of all the test subjects to be superior in terms of its presentation of the stereo image, and the degree of subtle differences that did not arise from the use of omnidirectional precision microphones where there is no separation in terms of directivity from sound from the other side of the sound field that is present.

Table 1 presents the rankings from the subjective assessment of wind turbines using headphones versus the line arrays.

Ranking	Headphones	Line Arrays in Hemi-Anechoic Space
1	Manikin	Spaced mics towards source
2	Spaced mic towards source	Mics 180^{o} apart
3	Mics 180^{o} apart	Manikin
Do not use	2250 (mono)	2250 (mono)

Table 1: Stereo Subjective Assessment Recommendations for External Noiie Sources

3.0 SENSATION INVESTIGATION

Because of a presentation by Dr Michaud at the ASA Salt Lake Meeting Wind Turbine Session in relation to the Health Canada investigations [8], discussions from other presentations [9] [10], and the session attendees, it appeared that several of the houses in the two study areas had been abandoned by residents, citing the issue of disturbance from wind turbines. Therefore, not all persons who may be considered sensitive to wind turbine noise were included in the Health Canada study [11].

Dr Michaud indicated to the attendees that in light of discussions in the Wind Turbine Session he would propose to Health Canada to undertake additional investigations of persons who had resided in the two study areas but had abandoned their houses because of disturbance, where such a study would be undertaken with the assistance of the community to obtain access to those individuals. The results of the suggested study had not been presented and as such, still left a question as to the relevance of sensitised people in terms of their ability to sense the operation of wind turbines.

To address the perception of persons who may be considered sensitised to wind turbine noise and examine the claim of residents sensing the operation of the turbines without actually hearing the noise, a series of experiments were undertaken utilising persons in Australia who have been identified as being sensitive to wind turbine noise, and low-frequency noise that exhibits pulsations occurring at an infrasound rate ("test group 1").

In 2013 Schomer proposed the possibility that a limited number of residents subject to noise from wind turbines may be experiencing motion sickness and suggested the construction of a test facility that utilise special transducers to extend down to very low frequencies (0.05 Hz or lower) [12]. Schomer proposed to undertake sensing tests that could then lead to further medical examinations on animals to develop an understanding why the phenomenon seems to affect some residents near wind farms and establish who are affected by wind turbine infrasonic emissions in various ways.

We have previously utilised one of our reverberation test chambers (having a volume of 126 m^3) with twelve 15" sub-woofers mounted on in the aperture between the reverberation chambers to investigate threshold of sensation versus threshold of hearing in the infrasound region [13], investigations into the 'infrasound signature" from wind turbines [14], [15] & [16]. Those investigations were undertaken using pure tones or external (free-field) noise measurements of wind turbine noise.

The chamber has been used to investigate the generation of recorded wind turbine noise versus field measurements to identify the issue of pulsations across the entire spectrum and that the synthesis method that has been proposed for creating the source signal over a wide band of frequencies [17] and a concept of synthesising a digital signal from analysed Leq FFT results but limited to just the infrasound region [18]. Those investigations found the synthesised results did not agree with our analysis of the original external source data that has been obtained in the field. Utilising a synthesised signal from an averaged (Leq) FFT to produce a steady signal lacks the on/off transitions, transients and variations that existed in the original time record.

For the subject study the original wave files obtained at house 87 from the Cape Bridgewater study [19] was used with a focus on the region of 30 Hz – 1250Hz. The source wave file signal obtained from measurements inside dwelling 87 at Cape Bridgewater, that have been used by several authors as a reference FFT Leq spectrum, was reproduced in the chamber utilising the sound system described above and provided the 1/3 octave band spectra shown in Figure 3. For the frequency range of interest the reproduced signal approximated the original signal as a 10 minute Leq level.

As a pilot study, 9 persons identified as sensitive to wind turbine noise or pulsating low-frequency industrial noise (test group 1) have attended our test chambers to participate in an experiment along the lines of the sensing tests in the format described by Schomer. A control group of 9 persons not previously exposed to turbine noise or pulsating low-frequency industrial noise (including 4 acousticians) participated in the same tests.

The reverberation room, with the addition of acoustic absorption treatment, satisfies the requirements of European Broadcasting Union Technical Document 3276 *Listening Conditions for the Assessment of Sound Programme Material: Monophonic and Two-Channel Sound* [19]. The maximum noise level under that standard for a mono signal is set at 85 dB(A). The distribution of absorption around

the perimeter of the reverberation room leads to the absence of lateral reflections from wall surfaces. As the walls of the chamber are core filled blockwork, from sound intensity and vibration measurements it was established that neither the walls, floor or ceiling of the chamber are generating structure borne noise from the speakers mounted on the baffle in the aperture.

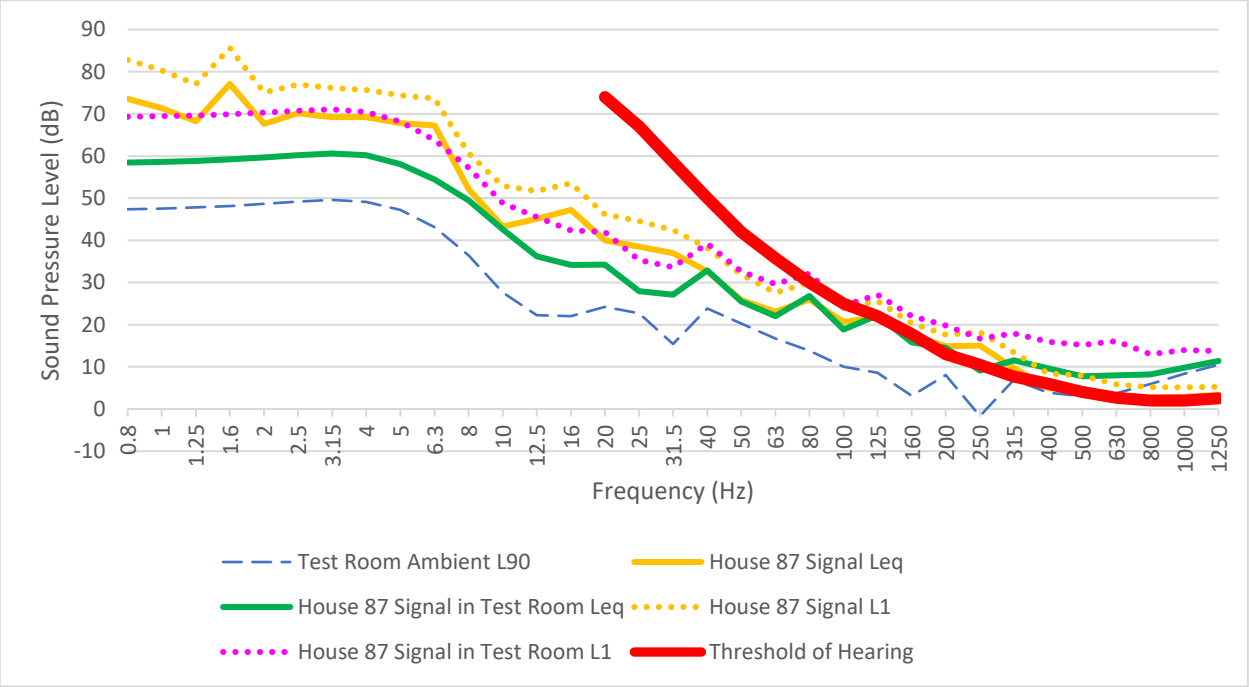


Figure 3: Spectra of Test Sample

The levels that were generated in the room approximate the 1/3 octave band levels obtained in house 87 (in the Cape Bridgewater study) [20] over the range of 40 – 1250 Hz. The response that falls off below 16 Hz reflects the absence of any graphics or parametric equalisation, and the limitations of the A-D convertor.

Table 2 presents the measured sound levels of the generated and ambient levels in the test chamber, with the derived sound level contributions in both the Leq level and the L90 level.

By any of the general measurement parameters used for wind farm assessments, the test signal contribution is at or below the ambient level. Of relevance to researchers of wind turbine noise, the testing had the wind turbine noise contribution as an Leq level of 12 dB(A) in a background level of 23 dB(A).

Weighting	Parameter	Ambient	Test Signal	Test Signal Contribution
Linear	Leq	69	69	60
	L90	57	57	49
dB(A)	Leq	24	24	12
	L90	23	23	9
dB(A) LF	Leq	8	10	8
	L90	-1	7	6
dB(C)	Leq	41	41	36
	L90	31	34	30

Table 2: Measured Levels and Derived Contributions of Test Signal

For the levels that were generated. the testing was undertaken in accordance with Australian Standard AS 1269.4 *Occupational Noise Management, Part 4: Auditory Assessment* [21] and the testing conducted in accordance with the ASA *Ethical Principles of the Acoustical Society of America for Research Involving Human and Non-Human Animals in Research and Publishing Presentations* [22]. An observer was present in the reverberation room during the testing.

The testing was conducted as multiple blind study tests. At no point in time were any of the participants advised what signal (if any) was being applied.

After a period of between 45 seconds to 3 minutes, all the 9 people in test group 1 could sense the presence of the wind turbine signal on 100% of the occasions in which the signal was presented, even though they were unable to hear the signal. At no point in time did any of these test subjects detect any audible signal.

One test subject (from the test group 1) identified a disorientation in the room where there was a perception of a tilt in the floor of about 20°.

The control group were exposed to the same test set up. After a period of some two minutes 2 people (including one a very distinguished Australian acoustician) could identify sensation, whilst the remainder of the control group never detected any sensation.

3.1 Observed Differences in the Sound Field – Hotspots

All the test group 1 subjects were requested to move around the room and identify any hotspots where there was a perception of a greater impact.

Two general areas were identified on either side of the radiating pattern for the baffle speaker systems (see Figure 4).

The test subjects identified the sensation that they were experiencing occurred in different parts of the body.

Seven people from test group 1 noise identified sensation in the back of the neck or the back of the head, and in four subjects there was also a tingling in the legs.

All the people from test group 1 were requested to rotate 360° to identify whether there was any position at which the sensation became stronger.

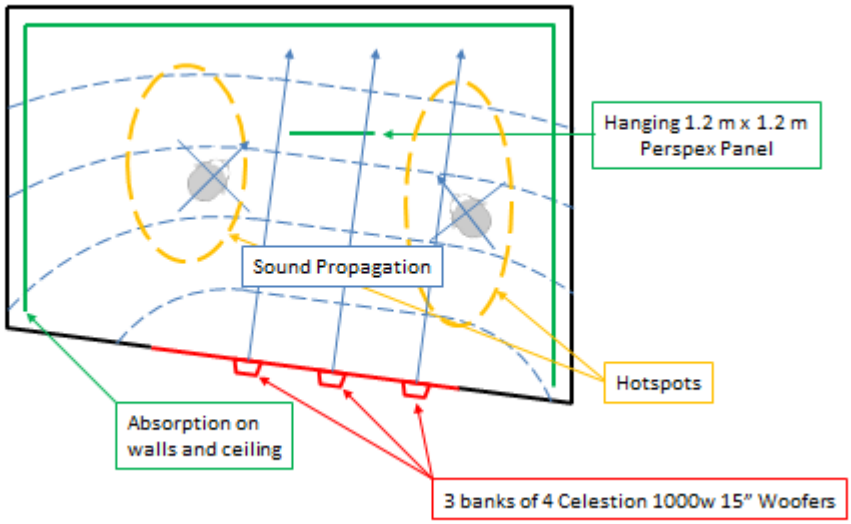


Figure 4 – Hotspots

In all cases except for two women (one person who has a hearing impairment), the test subjects identified that the greatest sensation occurred for an orientation where the back of the head was towards the speaker baffles but the body was turned at an angle of 45° so that the ear adjacent the baffle propagating sound field was closer to the speakers (see Figure 4).

The test subjects were then presented with audio headphones [6] that provide an SLC 80 attenuation of 11 dB, and then a set of hearing protectors [23] providing an SLC 80 of 26dB.

All test subjects (except the two women noted above) identified there was a difference in the perception of sensation in their head, but had difficulty expressing what that difference was. Both woman identified the test signal produced a sensation across the forehead. The headphones provided a slight difference but when using the ear muffs both participants felt the onset of nausea and the experiment was terminated. Does this result support the observation by Salt [24] of a greater Guinea pig ear response when there was less high frequency masking?

3.2 Manikin Investigation of Hotspots

The use of the manikin in the main chamber at the hotspots (identified by the subjects from test group 1) found no timing difference in terms of the arrival of pulsations for either ear, but that the orientation that produced the greatest level of disturbance to the test subjects revealed a slight pressure difference either side of the head.

For the two hotspot regions and the most sensitive angle to the sound field (135^o for the LHS and 225^o for the RHS – where 0^o is facing the speakers, as shown in Figure 5) the differences were noticeable in the mid band region of 250Hz – 2000 Hz.



Figure 5: Manikin at RHS hotspot set at 0^o position (facing speaker baffle)

A one third octave band analysis of the test signal revealed the following polar plots for the manikin (see Figure 5). This Leq pressure differential between the two ears as a result of the pulsating 2signal may be an area for further research (by others) as suggested by Schomer [11].

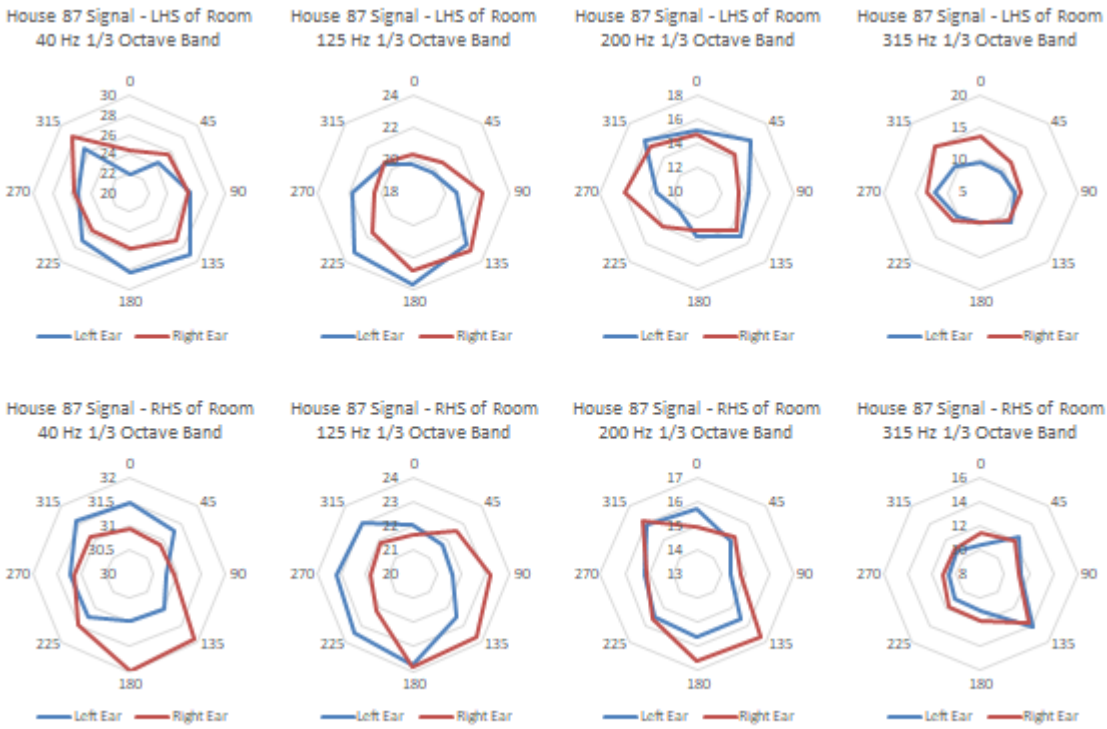


Figure 5 – Manikin at hotspots (degrees represent angle of nose to speakers)

3.3 Vibration on Hanging Perspex Panel

Testing of vibration levels inside dwellings in the Cape Bridgewater study, to evaluate whole-body vibration criteria, found insignificant levels of vibration with respect to the relevant Australian or British Standards [25] [26] that may be transmitted to the body.

If sensations are not just restricted to the inner ear and can also include response of the vestibular system of the body, a question arises as to the degree of vibration that may be induced into the body by way of the sound pressure field from turbines.

A perspex panel was suspended off the roof of the test chamber and could be seen to respond to the movement of people in the room and/or closing the nearest door to the panel. The panel required a long settling time (6 – 9 minutes) to return to a stationary position.

Observation of the panel with the application of the test signal found no perceptible vibration. However, examination of the shadow of the panel outline on the floor (from an elevated light) showed movement of the bottom of the panel.

Normal accelerometers cables used for vibration monitoring were found to be microphonic for the sound generated in the room (either by use of charge amplifier or voltage amplifier inputs). Higher sensitive accelerometers used for low-frequency seismic measurements were also found to have cables that resulted in pickup of the inaudible sound generated by the test signal and excessive mass that affected the damping of the panel, thereby presenting difficulty in obtaining vibration measurements using standard instrumentation.

However, the use of DC response accelerometers (Bruel & Kjaer Type 4575) [27] overcame that issue and found vibration levels obtained at the bottom of the swinging perspex panel were less than $1/50^{th}$ of the 31.5 Hz acceleration level and $1/20^{th}$ of the 4Hz acceleration levels suggested for the protection of the comfort of individuals subject to low-frequency vibration [25].

Further investigation into the response of the physical pressure wave on individuals is outside our expertise, and may be an area of interest to other researchers with access to the appropriate persons and instrumentation.

4. CONCLUSIONS

Testing of the response of individuals to audible wind turbine noise in recent years has typically utilised a mono noise source with a large bank of speakers in a modified reverberation room or listening environment.

Other testing purporting to assess the impact of infrasound from turbines, has not actually used the infrasound signal but has used either pure tones [28] [29] or a synthesised signal based a result of an FFT Leq analysis of the original signal and incorrectly claimed such noise sources as being “wind farm infrasound”.

Analysis of wind farm noise using wave files of actual wind farm noise (rather than any synthesised format or digitally designed signal) has found the typical FFT acoustical analysis is incorrect in terms of the fundamental formula of BT=1 for frequency analysis. That is, a finer resolution or small B requires a large T, and therefore a low temporal resolution to make the result valid. In the infrasound region the pulses are not present long enough to satisfy BT=1.

A modification of the Infrasound Logger from Huson Associates (Mark II) incorporates a modified filter and increased sample rate to address signal droop and obtain a faithful wave file to 150Hz.

Analysis of the wave files recorded at Cape Bridgewater reveals the presence of a dynamically pulsed amplitude modulation of the signal that occurs across the entire audible frequency band. The dominant bands where such noise is audible are in the low and mid frequency region.

All our field work to date that provides FFT or 1/3 octave band measurement data in relation to wind turbine infrasound, identified levels well below the nominal threshold of hearing. The limitation of instrumentation and sampling rates to provide an accurate and valid spectrum measurement in the infrasound region has been questioned (BT=1).

The previous work by the authors that identified the analysis/signature of pulses that occur at an infrasound rate, leads investigators to view the signal in the time domain and examine/describe/review the method of modulation with dynamically pulse amplitude modulation suggested as a more accurate description.

In endeavouring to reproduce an accurate signal in the time domain we have raised the issue of much higher sampling rates than normally encountered [31].

There are also issues with the creation of wind turbine “infrasound” in the laboratory [4].

The authors are of the opinion that experimental research limited to just wind turbine “infrasound”, whether tones or synthesised digital signals, is a waste of research time and money.

Reproducing and analysing the wind turbine signal including the audible range is an easier and simpler task to undertake and permits the essential work of identifying what creates sleep disturbance and physical impacts from wind turbine noise. Such research should be undertaken inside dwellings (in the field) and (subject to qualification of the sound field) may be undertaken in the laboratory.

Utilising wave files and playback of such signals at inaudible levels without requiring reproduction of infrasound is an easier and simpler task to undertake. The benefits of using a stereo signal for subjective assessment is clearly a superior method and a logical approach for any serious investigation into wind turbine noise.

Our previous paper into the stereo effect [2] found microphones spaced 1.9 metres apart for recording the signal and playback in a hemi anechoic space using line array speakers to be the preferred method by all test subjects for the subjective assessment of external wind turbine noise.

For utilising headphones, the recent testing has confirmed that the use of a stereo head torso (or in this exercise a cheaper version identified as a manikin) is the appropriate mechanism for undertaking further investigation into the subjective effects of wind turbines.

The application of the manikin to support the investigation of the subjective response of wind turbine affected persons in a mono generated sound field, utilising inaudible wind turbine noise, identified slight differences between the “ears” at the position identified by the test group as the hotspots (i.e. a greater perception of sensation with their backs to the sound source and one ear on an angle of 45° to the sound source).

The sensation perceived by the specific sensitive people (rather than the control group) was significantly stronger in the sound field exposed to the entire body when compared to just utilising headphones.

The results of the sensitivity testing require the expertise of other disciplines to explain the mechanisms by which the test subjects perceive the wind turbine noise to their entire body [30] and should be of interest to other researchers.

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Pam,

This is information that was requested by a couple of Commissioners and Mr. Knight. Please forward this email to Mr. Knight and all of the Commissioners.

Thank you,

Brenda Taylor

This letter is provided in response to the request by the board made at the Feb. 7, 2017 regular Commissioners' Meeting regarding Wind Tower effects on Property Values.

I spoke to Mr. David Janes of the Toronto area about his experience trying to sell his home. He told me that he tried to sell it himself for a short period of time. I also spoke with a person who looked at Mr. Janes' home during that time and decided his family could not live there because of all of the wind towers surrounding the property. Mr. Janes then contacted two realtors, one located in Sioux Falls and the other in Brookings. They both recommended to Mr. Janes that putting his home up for auction would be his best option.

After speaking with an appraiser and several realtors, the consensus was that it would be costly and would take many weeks, even months, to compile actual data to prepare a complete report. It was, however, recommended that governing bodies should pursue such information.

Katie Murray, a realtor with Century 21 in Brookings, did state that homes located near wind towers absolutely experience property devaluation. She gave as an example a home located in the middle of a wind farm in Brookings Co. which was listed and viewed 15 times. All of the prospective buyers walked away, not wanting to live near wind towers. She stated that homes that would normally sell quickly are not selling as they should when located near wind towers. A statement she sent via e-mail follows:

"In my experience, wind towers do affect a buyers desire to purchase a property. One particular listing was in a wind farm, had numerous showings, and the majority of feedback was an issue with the towers. This home was priced well, comfortable distance to a city, and almost fully remodeled. It should have sold quickly, but did take longer and for assumably [sic] less than what they would've gotten had the wind towers not been so close."

I also contacted an appraiser, Mr. Brian Gatzke, ARA, MBA, Certified Appraiser from Northern Plains Appraisals located in Brookings. Mr. Gatzke told me about two homes that were located in Brookings Co. before the wind towers went up and the homeowners tried to sell after the towers were built. Both homes were greatly discounted before they could be sold. One was sold to an adjacent landowner. Mr. Gatzke also said that wind towers do have a negative impact on residential properties. I asked him if appraisers take into account the surroundings of a residential property when writing their reports, and he replied, "Yes, appraisers do have rules and need to verify market conditions and the surroundings of a property and it does show up in a report. Surroundings do have an impact on appraisal values." He has concluded that wind towers do, in fact, negatively impact appraisal values. He also suggested that counties should do complete and thorough investigations giving three examples how this might be accomplished. It is a costly and time consuming endeavor.

My goal was to gather local information only regarding residences located near wind towers. Again, those who talked to me stated that they did not have time to do actual research but shared their experiences. I attempted contact with other resources that chose not to respond.

Mike and I have provided emails with links to property devaluation studies of residences due to close proximity to wind towers done by Michael McCann. Please feel free to contact me if you would like more information.

In light of what we have learned, we strongly advocate for Property Value Guarantees in the Ordinance.

Thank you for your time,

Brenda Taylor

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.

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

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, 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 <u>all</u> 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 <u>mature</u> 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.

    - 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-accoustic" 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 i**n **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 Clayton, 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 = $36,660,000

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 X 25% = $4,647,500
2-mile zone: $36,660,000 X 5% = $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.

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 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

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.

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 (1); public services (II); public accommodations and services operated by private entitles (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 parities without prior written

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)

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 &

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

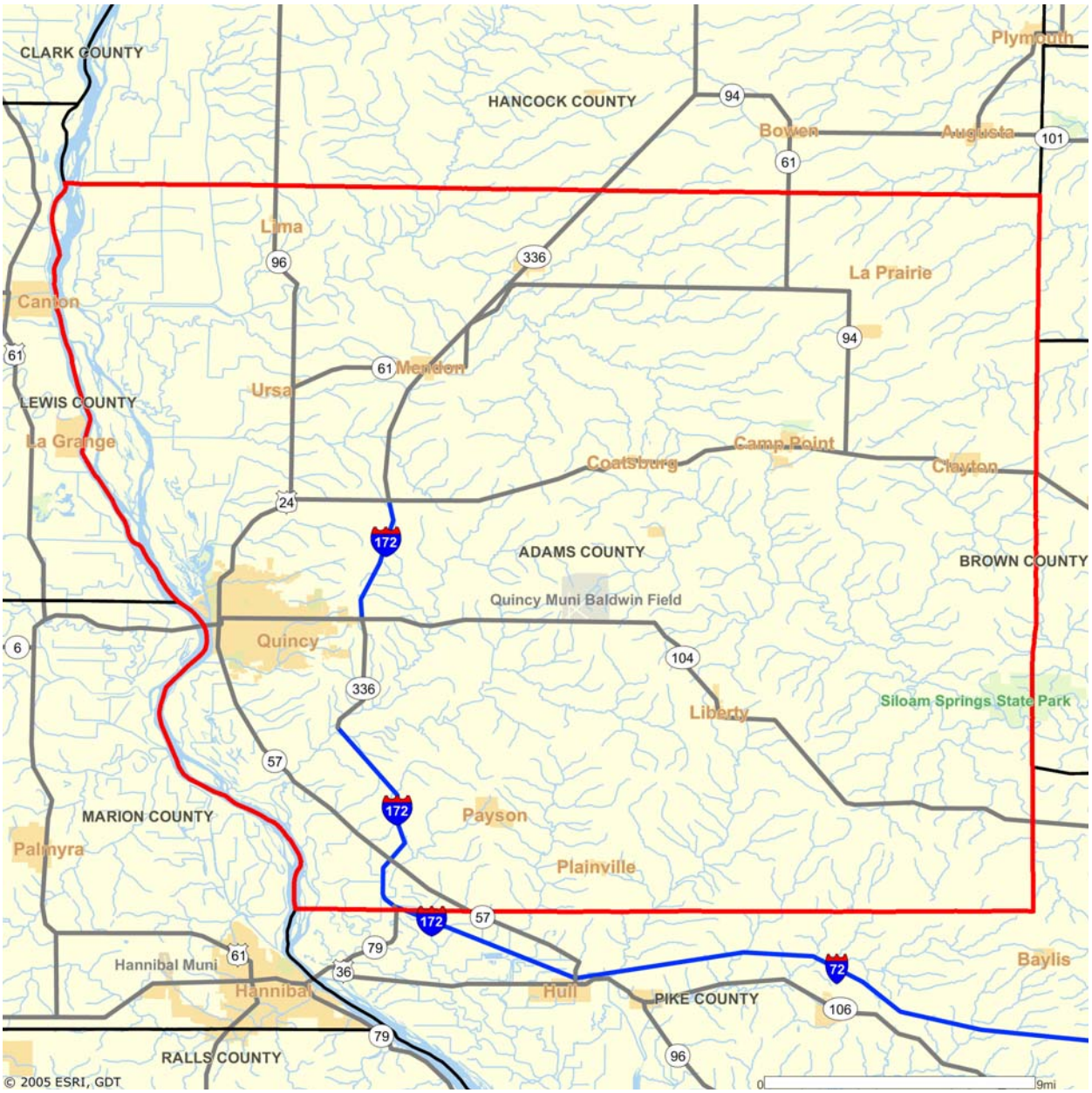
Specialized appraisal education includes successful completion of Real Estate Appraisal Principles, Appraisal Procedures, Residential Valuation, Capitalization Theory and Techniques Part A, Uniform Standards of Professional Appraisal Practice and USPAP update courses, Case Studies in Real Estate Valuation, 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)*

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

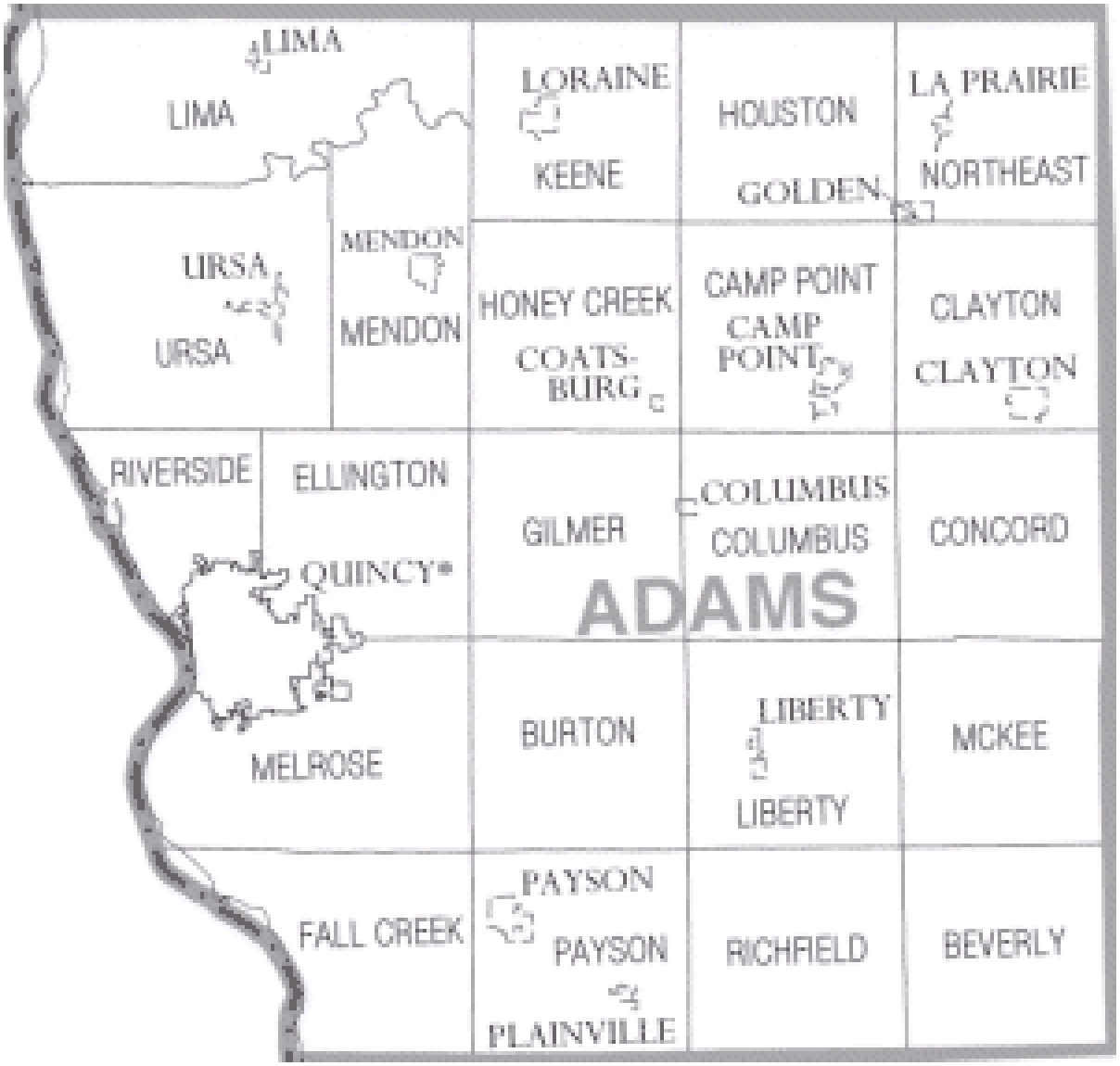
Per Capita Income
2000 $17,894
2005 $20,584
2010 $23,864

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.


LIMA
LIMA
LORAINE
KEENE
HOUSTON
GOLDEN
LA PRAIRIE
NORTHEAST
URSA
URSA
MENDON
MENDON
HONEY CREEK
COATS-
BURG
CAMP POINT
CAMP
POINT
CLAYTON
CLAYTON
RIVERSIDE
ELLINGTON
QUINCY*
GILMER
COLUMBUS
COLUMBUS
CONCORD
ADAMS
MELROSE
BURTON
LIBERTY
LIBERTY
MCKEE
FALL CREEK
PAYSON
PAYSON
PLAINVILLE
RICHFIELD
BEVERLY

Appendix A

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 wit 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 (2^{nd}) 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 spaying services active in Adams County or the actual contracted 3^{rd} 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:

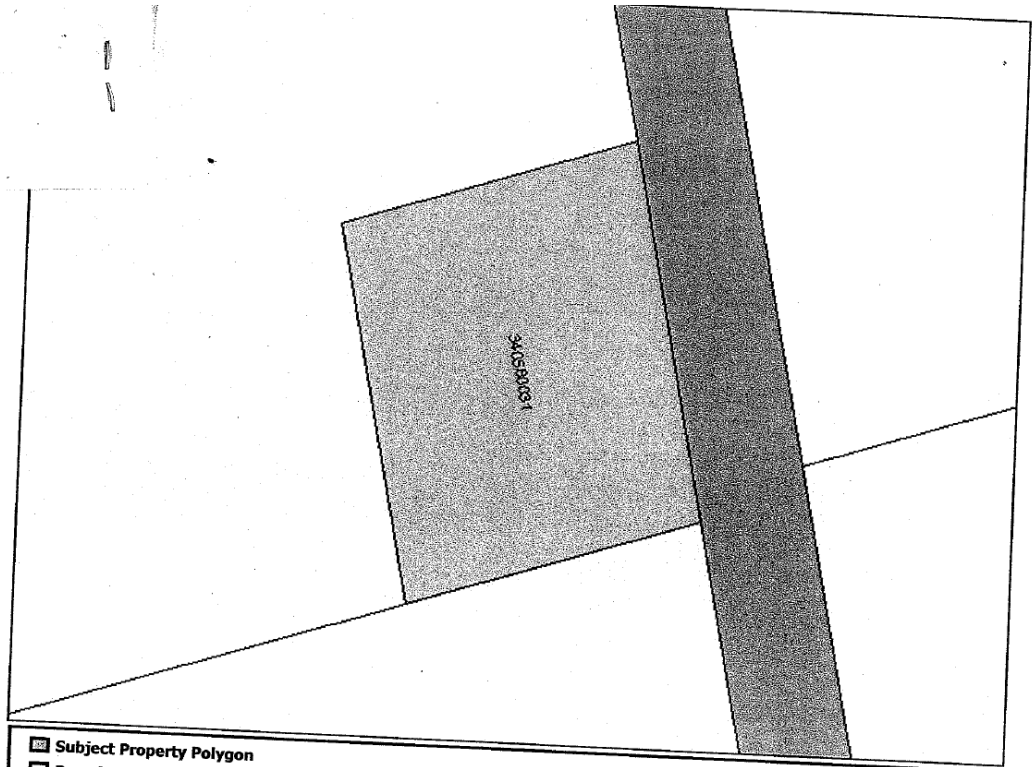
By _____
Name Title Date

PROPERTY OWNERS:

By _____
Name Date

Notary _____

Appendix B



Subject Property Polygon
Parcel Polygons
Roads
Railways
Water Limits
Easement Limits
Subject Property Point
Neighbourhood Sales Points

0 10 m.

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N
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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

CRIPTION	PT LT 29 CON 7, PT 1 7R742 ; AMARANTH
ARTY 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	[redacted]	T	[redacted]

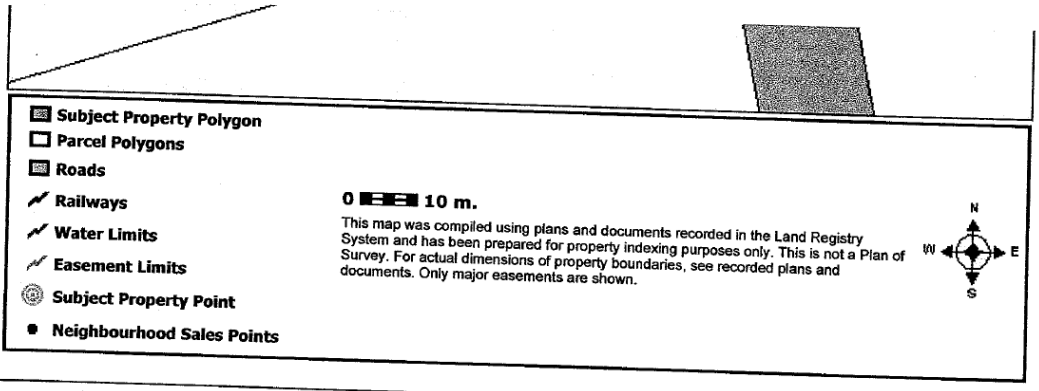
Reports Not the Official Record. Reports, other than the Parcel Register, obtained through Geowarehouse are not the official government record and will not necessarily reflect the current status of interests in land.

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.

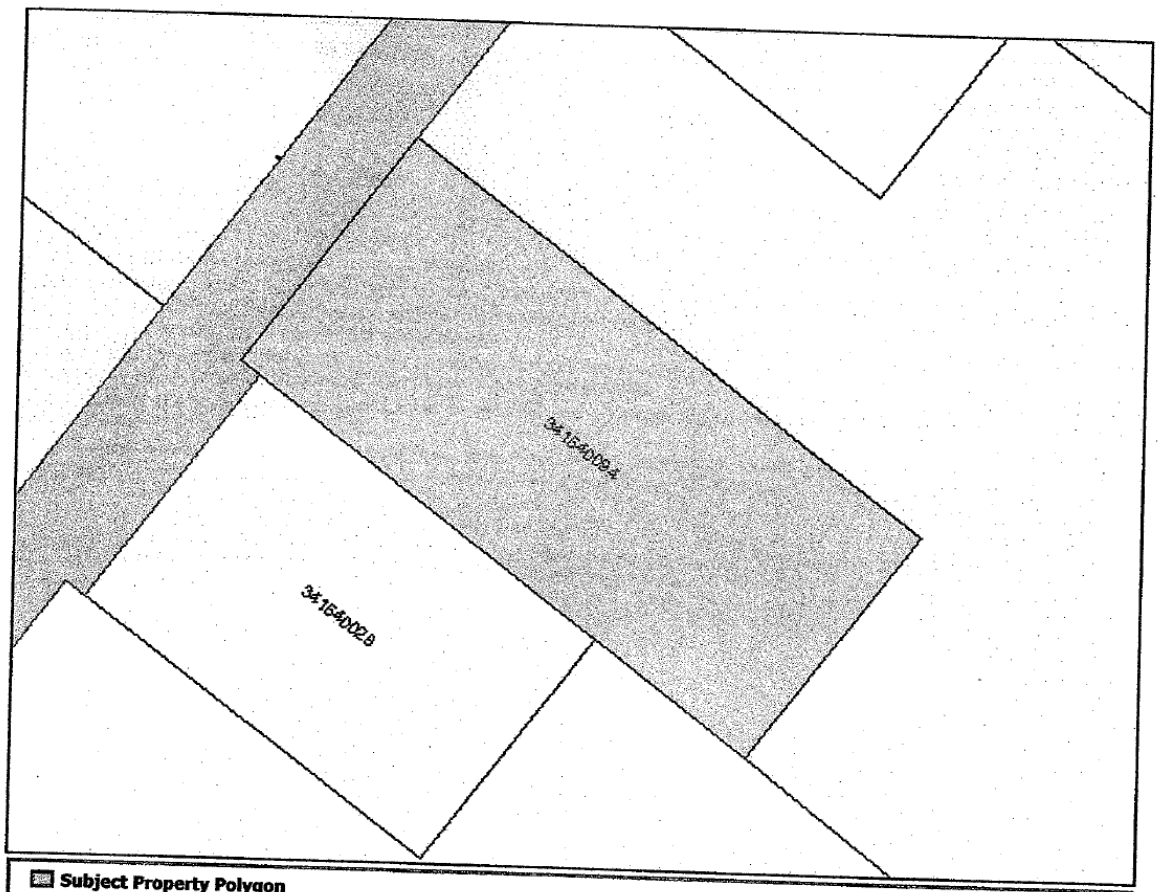
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Completeness of the Sales History Report. Some Sales History Reports may be incomplete due to the amount of data collected during POLARIS title automation. Subject properties may also show nominal consideration or sales price (e.g. $2) in cases such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

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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 Polygon
Parcel Polygons
Roads
Railways
Water Limits
Easement Limits
Subject Property Point
Neighbourhood Sales Points

0 10 m.

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N W E S

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.

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	[redacted]	T	WILLIAMS, SANDRA MARIE BLANCHE; WILLIAMS, STEPHEN ROGER BLAINE
LTD11538	07/31/1998	[redacted]	T	[redacted]
MF229782	08/08/1997	[redacted]	T	[redacted]

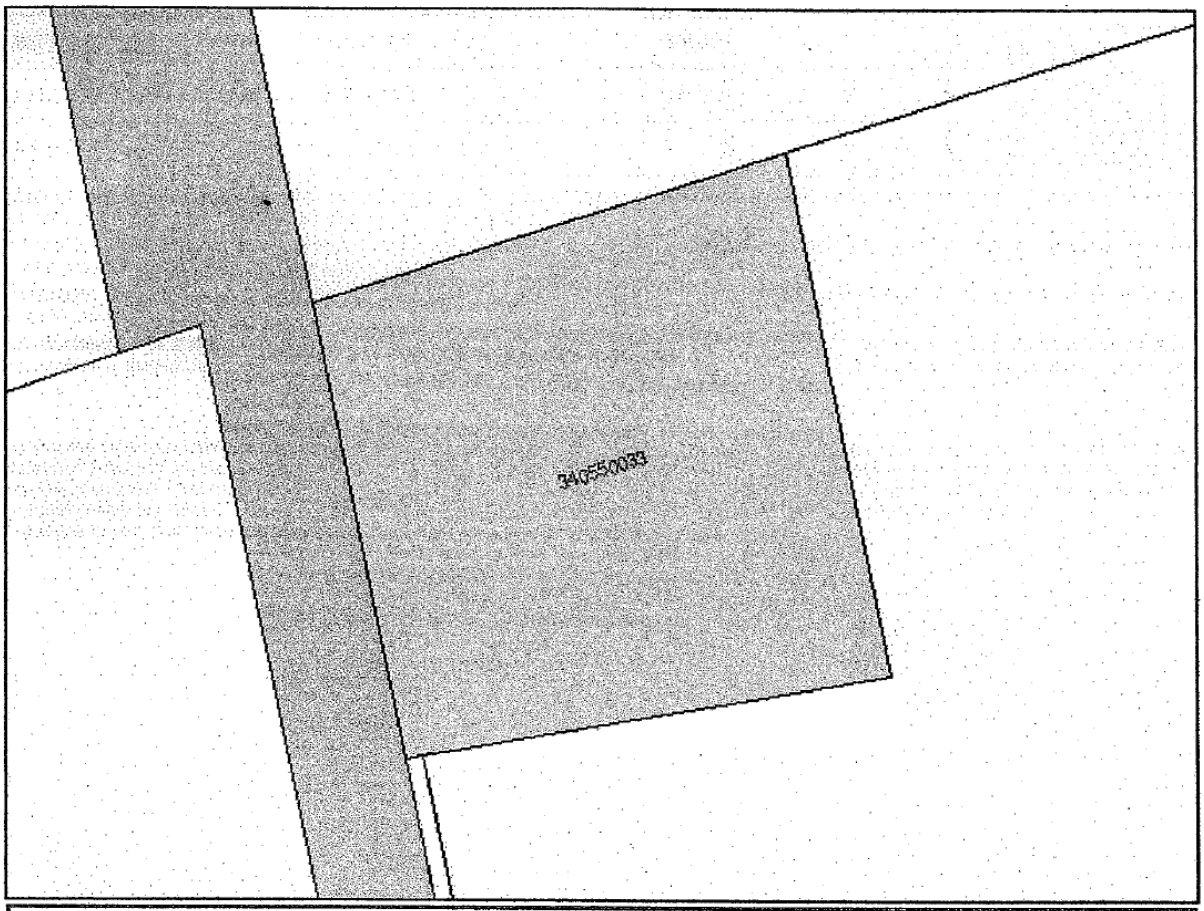
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Subject Property Polygon
Parcel Polygons
Roads
Railways
Water Limits
Easement Limits
Subject Property Point
Neighbourhood Sales Points

0 10 m.

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W E
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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.

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	[redacted]	T	BROWNELL, ROY; BROWNELL, TERESA
MF124008	05/15/1984	[redacted]	T	[redacted]

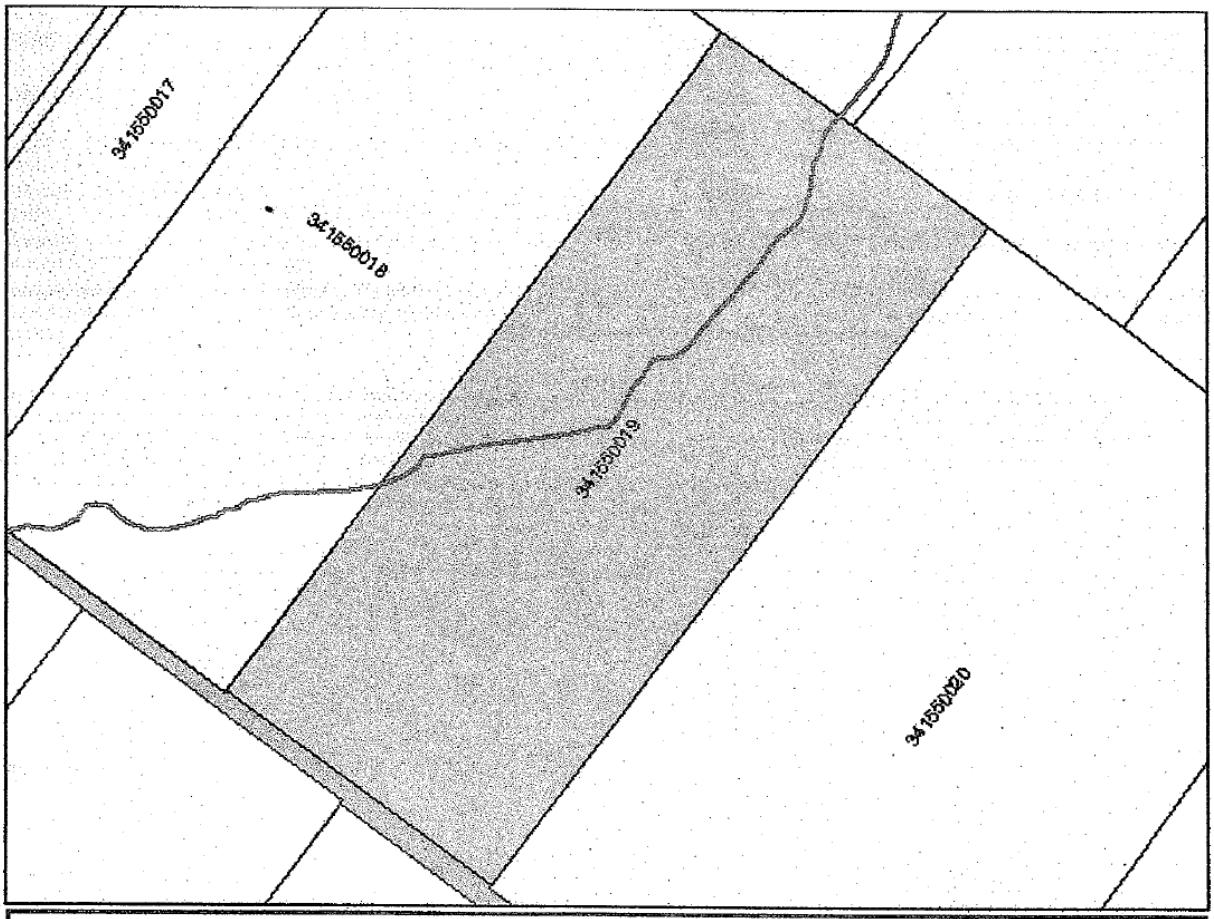
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SUBJECT PROPERTY IDENTIFICATION INFORMATION	
LRO	07
PIN	341550019
ASSESSMENT ROLL NUMBER	221900000521900
REGISTRATION TYPE	LT
LAND REGISTRY STATUS	ACTIVE
MUNICIPALITY	N/A
ADDRESS	N/A
AREA	409793 m2
PERIMETER	2836 m
DESCRIPTION	PT LTS 284 & 285, CON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

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	[redacted]	T	BENVENETE, WALTER MARK

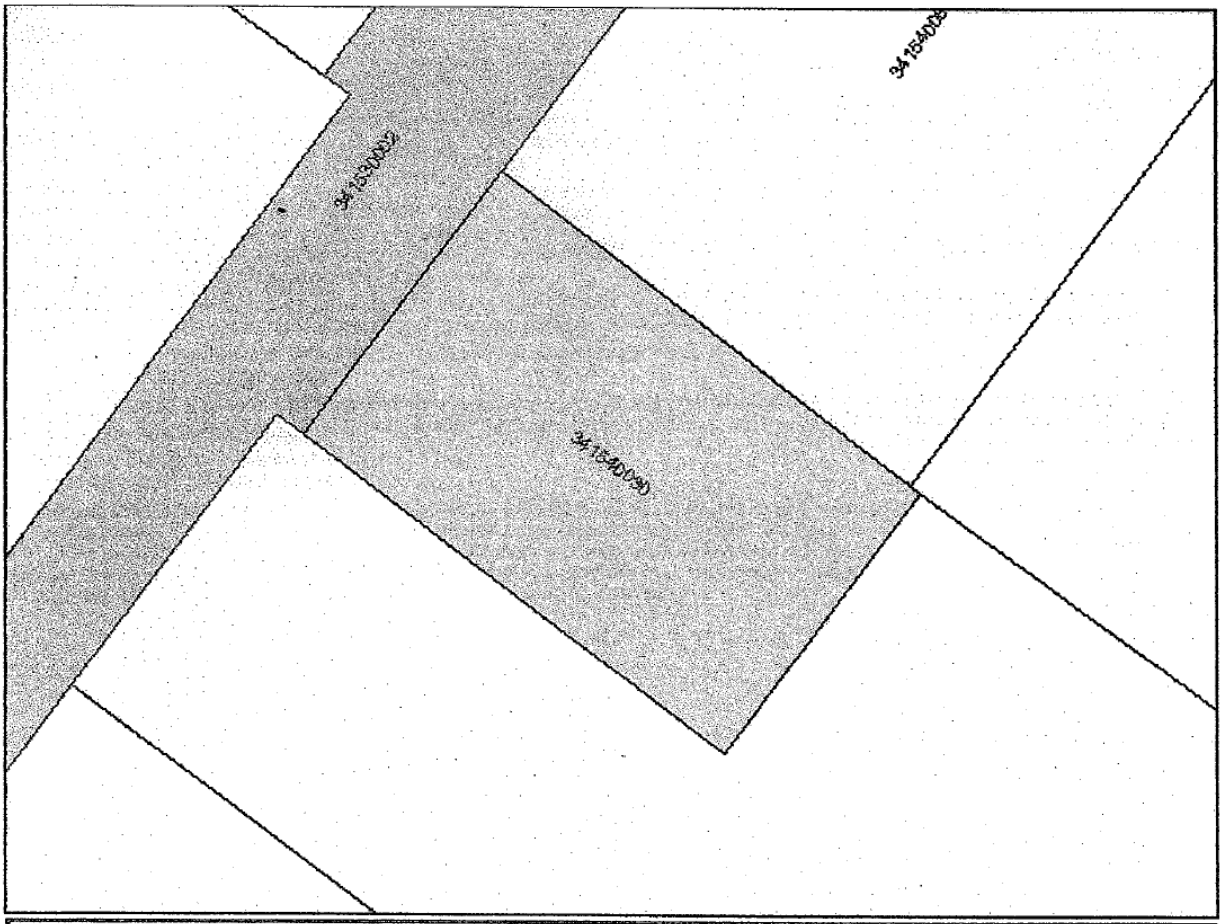
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SUBJECT PROPERTY IDENTIFICATION INFORMATION	
LRO	07
PIN	341540030
ASSESSMENT ROLL NUMBER	221900000613850
REGISTRATION TYPE	LT
LAND REGISTRY STATUS	ACTIVE
MUNICIPALITY	SHELBURNE
ADDRESS	58234 COUNTRY ROAD 17
AREA	4048 m2
PERIMETER	262 m
DESCRIPTION	PT LT 291, CON 2 SWTS, PT 2, 7R924 ; MELANCTHON
PARTY TO:	CANADIAN HYDRO DEVELOPERS, INC.

LES 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	[redacted]	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.

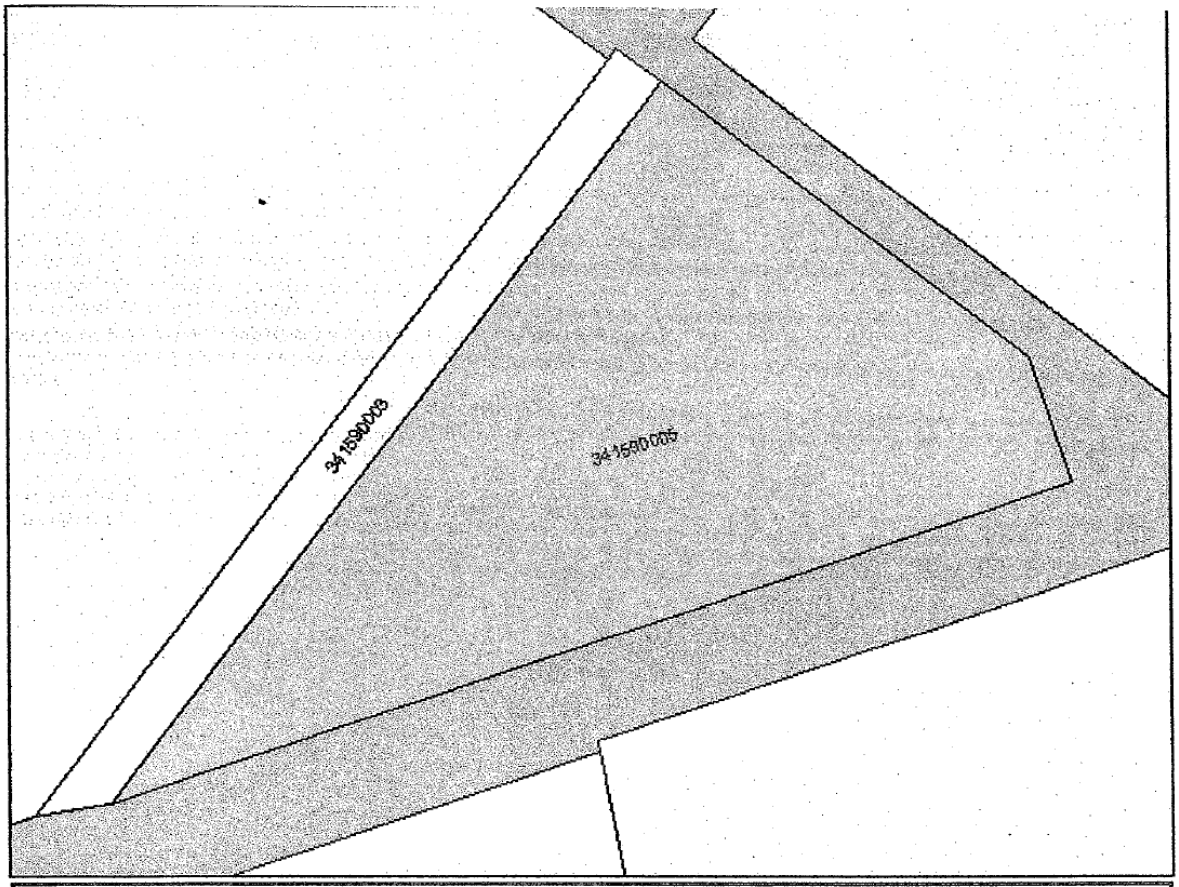
Currency of Information. Data contained in the Geowarehouse reports are not maintained real-time. Data contained in reports, other than the Parce Register, may be out of date ten business days or more from data contained in POLARIS.

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Subject Property Polygon
Parcel Polygons
Roads
Railways
Water Limits
Easement Limits
Subject Property Point
Neighbourhood Sales Points

0 100 m.

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N W E S

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.

ES 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	[redacted]	T	BARLOW, DAVID CHARLES; BARLOW, SHERYL ANN
MF157736	06/15/1988	[redacted]	T	[redacted]

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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Appendix C

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	1,684	$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	$166.74
							Average sale price	$78.84
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	$73.16
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	BMV 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 Melugens 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 Carnahan 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	Barnhill	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	Schlafke	Fromhertz	2	1,400	$127.86
53	2512 Shaw Rd.	Jun 2004	$153,500	Hlavin	Kapinski	2	1,638	$93.71
							Average sale price	$104.72

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%**	

Appendix D

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

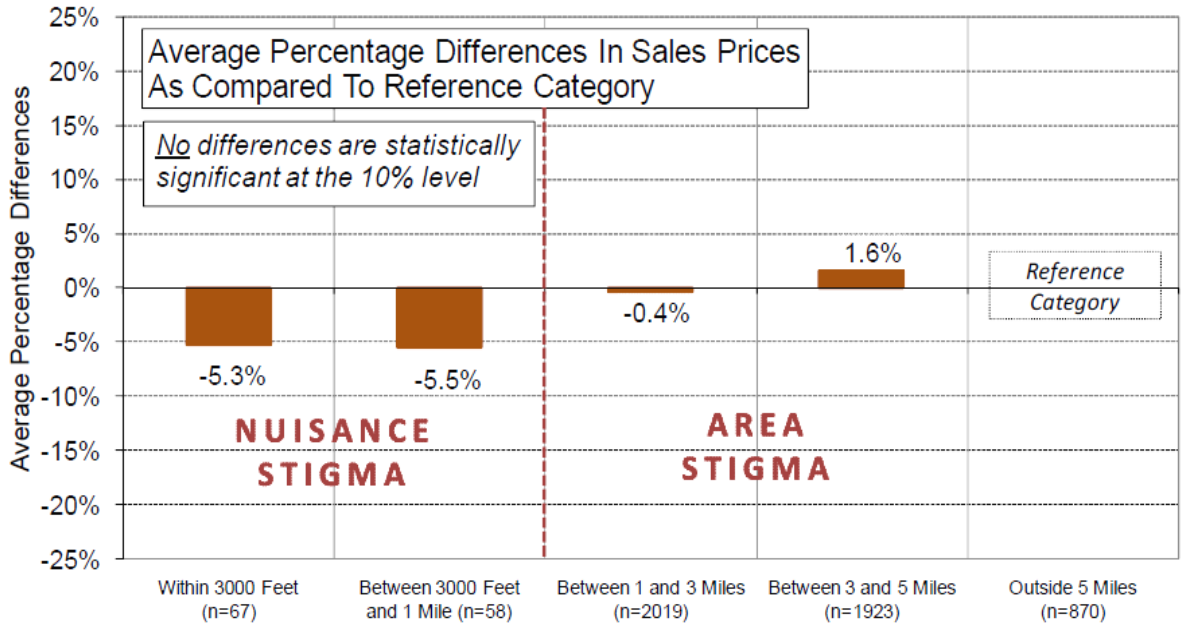
The work described in this report was funded by the Office of Energy Efficiency and Renewable Energy (Wind & Hydropower Technologies Program) of the U.S. Department of Energy under Contract No. DE-AC02-05CH1123.

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.

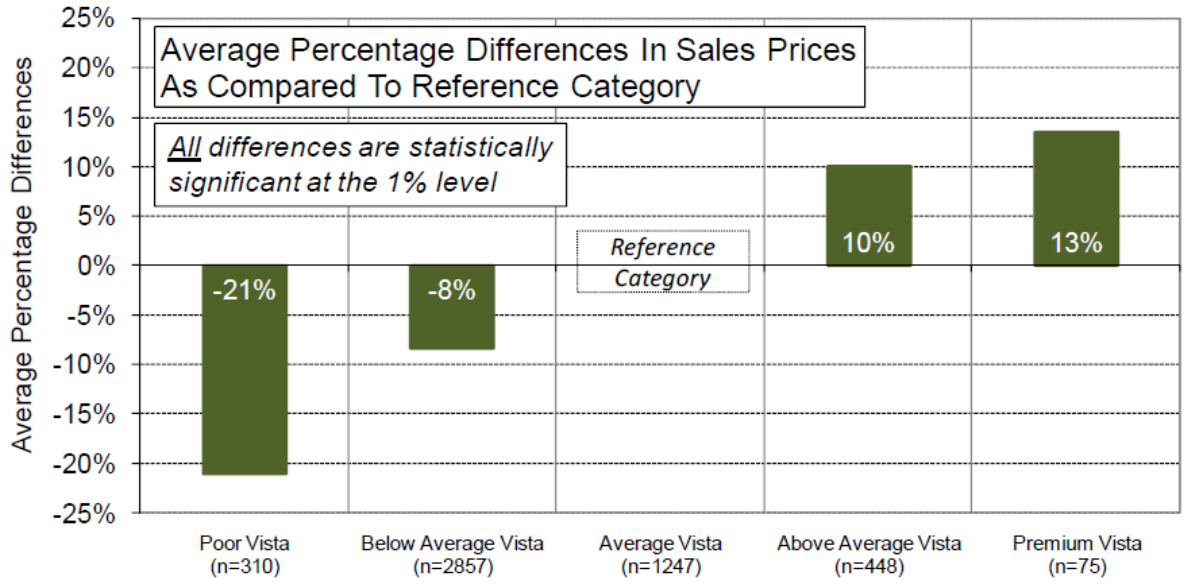
The following Figures ES-1, ES-2, ES-4 and photograph Appendix D & E were copied from this report without any editing by McCann Appraisal, LLC.

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



The reference category consists of transactions for homes situated more than five miles from the nearest turbine, and that occured after construction began on the wind facility

Figure ES-2: Base Model Results: Scenic Vista



The reference category consists of transactions for homes with an Average Vista, and that occured after construction began on the wind facility

Appendix D: Vista Ratings with Photos

POOR VISTA





BELOW AVERAGE VISTA





AVERAGE VISTA





ABOVE AVERAGE VISTA





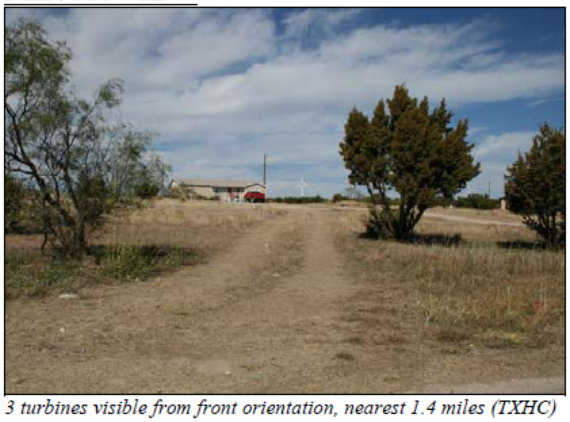
PREMIUM VISTA





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 (NYMC)

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 (IABV)



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

EXTREME VIEW

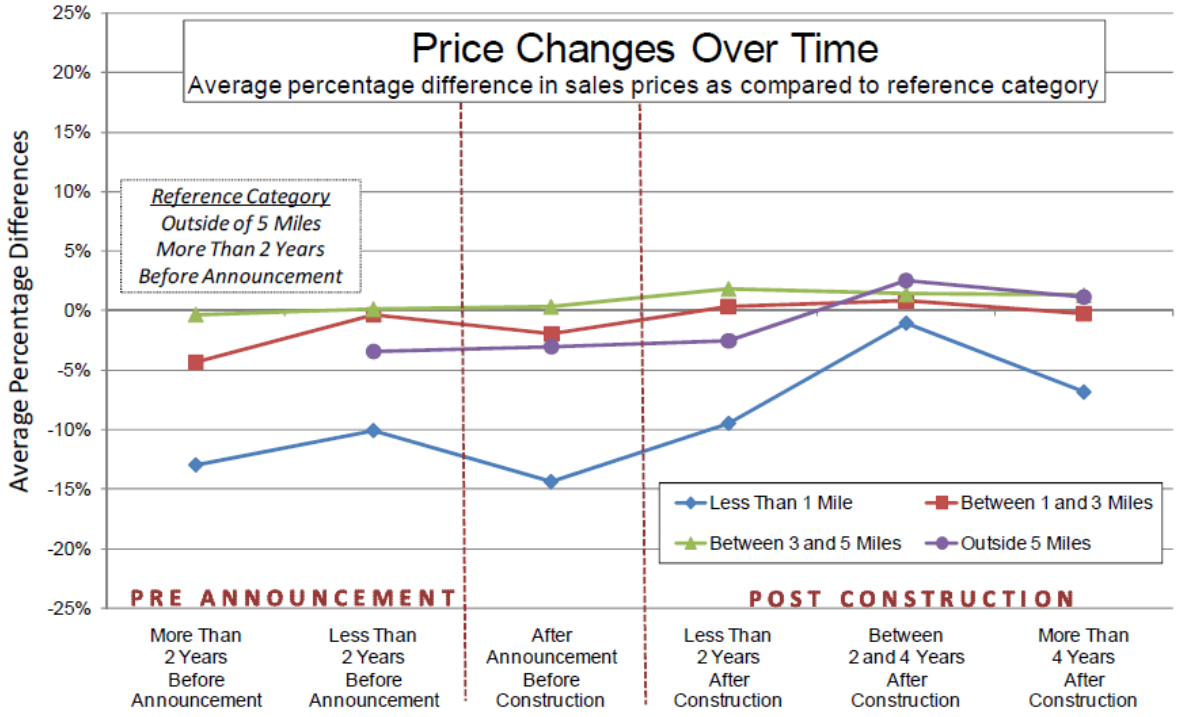


6 turbines visible from multiple orientations, nearest 0.2 miles (WIKCDC)



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

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."

Appendix E

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.



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[7], though most are left to make the best they can with a piece of property that will be difficult, if not impossible[8], 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 the 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 and higher and more consistent and fisheries are less impacted.

The plan received an enthusiastic response from the Maine Lobstermens 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 e 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 compsensation 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

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

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”

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. "

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 Hulthen	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 Cherly 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
Burtchell 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 Aper	IL	Rail Splitter		1500	sued; settled; sold at reduced price. Horizon wind guarenteed property value
Todd and Jill Stules	PA	Allegheny Ridge		2000	sued over noise; case accepted in court and pending

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

My Name is David Janes. I live at 19574 479th Avenue in Deuel County. My phone numbers are land 605-794-2023 and mobile 605-695-5114.

My wife Linda and I bought acreage of 15 acres about 2 miles Southeast of Toronto in 1999. We built a new house with 2 x 6 studs, sheathing and a full brick veneer. Our walls are nearly 12" thick. We took occupancy in 2001. We intended for this to be our retirement home.

A few months after we moved in we were asked by a neighboring farmer if we had any objections to wind towers in the neighborhood. We were not in favor of any within our immediate area. Much to our surprise wind tower construction proceeded in 2003 without any prior notification to us.

While the 1,000 foot setback was probably used it makes no difference. The shadows from the turbine blades hit our house from all directions every day! And even with the limited available light at night you are still able to see shadows moving across the house. It is especially disturbing during any outdoor activities. Sometimes it is absolutely shocking and makes you think someone is creeping up behind you. The flashing red lights are almost as distracting as the blade shadows. There is never a peaceful night of solitude.

We installed blinds and draperies and are still getting that light sweep through and around the windows. The noise is even worse. We are NEVER left in silence when the turbines are active. When there is moisture in the air it can sound like the roar of a jet engine.

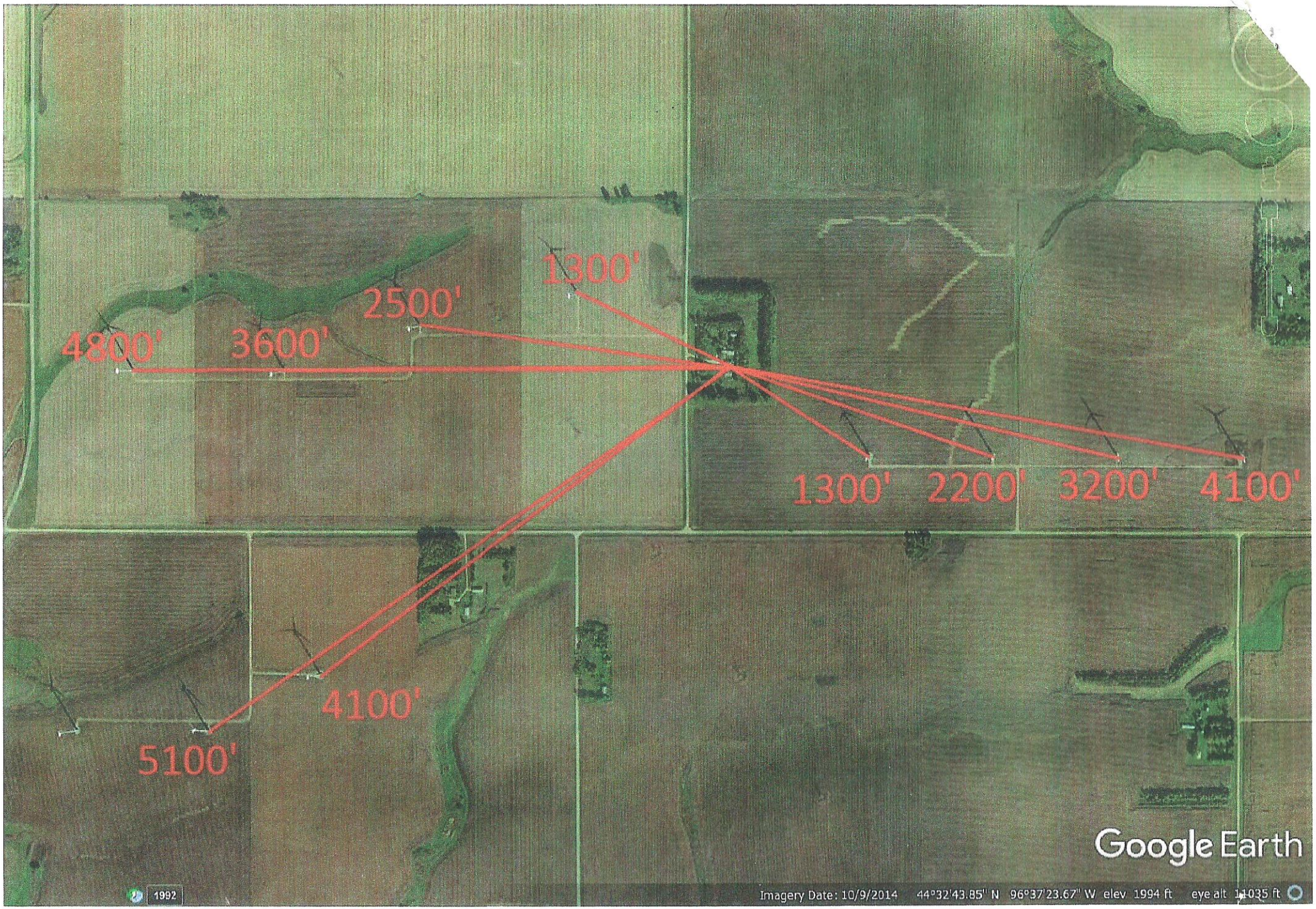
We invested over $500,000 in our home but we had to live with headaches caused by the constant flashing and noise. We even bought a camper for the sole purpose of getting away to a peaceful location for a month or more at a time. Unfortunately my wife Linda passed away last year. The peace and solitude we expected has been completely taken from us. If I could get my investment back I would do so and leave immediately.

David Janes 3-18-17

David Janes

19574 479th Avenue

Astoria, SD 57213


1300'
2500'
4800'
3600'
1300'
2200'
3200'
4100'
4100'
5100'
Google Earth
1992
Imagery Date: 10/9/2014 44°32'43.85" N 96°37'23.67" W elev 1994 ft eye alt 11035 ft

Toronto Area Interviews

The purpose of these interviews is to investigate how residents are reacting to living next to the wind turbines south of Toronto in Deuel County.

There are 24 existing wind turbines in Deuel County according to 2015 satellite imagery. Interviews were conducted with residents who live within 1 mile of the existing wind turbines.

According to 2015 satellite imagery, 17 Deuel County residences were counted within 1 mile of the existing wind turbines .

15 interviews were conducted as shown on the following pages. 13 of the interviews were with Deuel County residents. The 2 interviews in Brooking County were with residents who live just south of the Deuel-Brookings county line road.

The number of wind turbines within a mile of each residence is shown on each interview. Distances listed were measured off satellite imagery from the center of the house to the center of the wind turbine. All distances were rounded to the nearest 100 feet. The distances are also shown in miles for informational purposes.

Residents were simply asked what it was like living next to the wind turbines. If a resident voluntarily shared concerns about noise or shadow flicker, some follow up questions regarding the level of noise and frequency of shadow flicker were asked. All interviews were conducted in person (by Mark Junker) at the residence.

Also noted on each interview is any other relevant information that was volunteered. All interviews were ended with a question regarding if the owner was receiving any compensation from the wind developer.

Interview #1 w/ owners June 4 and 12, 2016 Deuel County

Turbine	Distance (feet)	Distance (miles)
1	1200	0.23
2	1500	0.28
3	1900	0.36
4	2500	0.47
5	2900	0.55
6	3300	0.63
7	4100	0.78
8	4700	0.89

Noise:

- describes noise as bad & loud (comparable to jets at an airport)
- noise prohibits the joy of campfires in the evening
- noise prevents house windows from being opened at night

Shadow Flicker:

- describes shadow flicker as bad
- shadow flicker occurs approximately ½ hour in morning and evening from approximately November to February
- can't block the shadow flicker out of the house

Other:

- owners worried about property value
- owners do not receive any compensation from the wind developer

Interview #2 w/ owner June 4, 2016 Brookings County

Turbine	Distance (feet)	Distance (miles)
1	1300	0.25
2	1700	0.32
3	1700	0.32
4	2300	0.44
5	2300	0.44
6	3000	0.57
7	3100	0.59
8	3300	0.63
9	3800	0.72
10	4300	0.81
11	4500	0.85
12	4600	0.87
13	5000	0.95
14	5100	0.97

Noise:

- complained of noise

Shadow Flicker:

- complained of shadow flicker

Other:

- described living next to wind turbines as "it sucks"
- described a blade flying off of a wind turbine and stabbing in the ground in an upright position – unclear on exact distance the blade landed away from the wind turbine – described distance as "a ways"
- said deer were coming back to the area after being gone since construction of the wind turbines
- owner does not receive any compensation from the wind developer

Interview #3 w/ owner June 4, 2016 Brookings County

Turbine	Distance (feet)	Distance (miles)
1	1200	0.23
2	2100	0.40
3	2200	0.42
4	2300	0.44
5	2600	0.49
6	3100	0.59
7	3200	0.61
8	3500	0.66
9	4300	0.81
10	4400	0.83
11	4700	0.89
12	4800	0.91
13	5000	0.95

Noise:

- noise really bad in freezing fog

Shadow Flicker:

- shadow flicker around 2 pm from approximately February to March

Other:

- owner does not receive any compensation from the wind developer

Interview #4 w/ owner's adult son October 2, 2016 Deuel County

Turbine	Distance (feet)	Distance (miles)
1	1900	0.36
2	2600	0.49
3	3400	0.64
4	4600	0.87

Noise:

- no noise complaints except can hear wind turbines in the house during the winter
- described moving parts of the wind turbines as louder in the winter (compared it to your vehicle making more sounds in the cold)

Shadow Flicker:

- none

Other:

- complained field/access road washes out
- father (owner) receives compensation from the wind developer

Interview #5 w/ owner October 2, 2016 Deuel County

Turbine	Distance (feet)	Distance (miles)
1	1900	0.36
2	2200	0.42
3	2800	0.53
4	2900	0.55
5	3600	0.68
6	3700	0.70
7	3800	0.72
8	4000	0.76
9	4100	0.78
10	4200	0.80
11	4600	0.87
12	4700	0.89
13	5200	0.98

Noise:

- no noise complaints

Shadow Flicker:

- owner did not complain of shadow flicker
- owner mentioned that a guest did wonder what the shadow moving across the guest bedroom was

Other:

- only real complaint was they were dealing with some compaction issues in some fields yet due to construction traffic outside of the access roads
- owner receives compensation from the wind developer

Interview #6 w/ owner October 2, 2016 Deuel County

Turbine	Distance (feet)	Distance (miles)
1	2200	0.42
2	2400	0.45
3	3000	0.57
4	3300	0.63
5	3800	0.72
6	3800	0.72
7	3900	0.74
8	3900	0.74
9	4200	0.80
10	4400	0.83
11	4500	0.85
12	4700	0.89
13	5200	0.98

Noise:

- can hear noise in the house with the windows closed
- claimed noise can be "10 times louder than today"

Shadow Flicker:

- shadow flicker once in a while in the winter

Other:

- owner receives compensation from the wind developer

Interview #7 w/ owner's fiancé October 2, 2016 Deuel County

Turbine	Distance (feet)	Distance (miles)
1	4500	0.85
2	4600	0.87
3	4700	0.89
4	5300	1.00

Noise:

- described noise as light whooshing sound
- no noise problems

Shadow Flicker:

- unknown

Other:

- not known if owner receives any compensation from wind developer

Interview #8 w/ owner October 2, 2016 Deuel County

Turbine	Distance (feet)	Distance (miles)
1	5000	0.95
2	5000	0.95
3	5200	0.98

Noise:

- noise described as minimal

Shadow Flicker:

- none

Other:

- owner does not receive any compensation from the wind developer

Interview #9 w/ owner October 2, 2016 Deuel County

Turbine	Distance (feet)	Distance (miles)
1	4500	0.85
2	5100	0.97

Noise:

- describes noise as similar to military aircraft with propellers
- does not sleep with windows open due to noise
- does not wear hearing aids outside to avoid hearing the noise

Shadow Flicker:

- shadow flicker in evenings for approximately 20 minutes
- no shadow flicker in summer time

Other:

- the blinking lights on the wind turbines at night are an annoyance
- had house for sale 79 days this summer, owner's opinion is that there was no interest in the house due to the wind turbines
- owner does not receive any compensation from the wind developer

Interview #10 w/ owner October 8, 2016 Deuel County

794-2023

Turbine	Distance (feet)	Distance (miles)
1	1300	0.25
2	1300	0.25
3	2200	0.42
4	2500	0.47
5	3200	0.61
6	3600	0.68
7	4100	0.78
8	4100	0.78
9	4800	0.91
10	5100	0.97

Geo/David 2Dec16 AM Livestock near surrounding grid

Noise:

- described noise as bad
- wind turbines are much noisier than they are today
- can hear noise inside the house with windows closed (owner also noted it was a very well built house)

high noise during Hazing foggy days

Shadow Flicker:

- shadow flicker is a problem most months during the year

Other:

- owner wants to sell house, but can't
- owner hates the wind turbines
- no geese in the area since construction of the wind turbines
- owner does not receive any compensation from the wind developer

Interview #11 w/ owner October 8, 2016 Deuel County

Turbine	Distance (feet)	Distance (miles)
1	1200	0.23
2	2000	0.38
3	2400	0.45
4	2800	0.53
5	2900	0.55
6	3500	0.66
7	3800	0.72
8	4500	0.85

Noise:

- owner was used to the noise – no noise complaints
- can't hear noise in house

Shadow Flicker:

- no shadow flicker complaints

Other:

- owner does not mind the wind turbines
- not known if owner receives any compensation from wind developer

Interview #12 w/ owner October 8, 2016 Deuel County

Turbine	Distance (feet)	Distance (miles)
1	2500	0.47
2	3300	0.63
3	4100	0.78
4	4800	0.91
5	4900	0.93
6	5000	0.95
7	5100	0.97

Noise:

- described noise as bad
- described a vibration inside the house at times from the wind turbines
- dogs go nuts sometimes due to noise

Shadow Flicker:

- described shadow flicker as happening all the time

Other:

- no geese or wildlife around anymore due to wind turbines
- owner #@!#&% hates the wind turbines
- owner does not receive any compensation from the wind developer

Interview #13 w/ owner October 8, 2016 Deuel County

Turbine	Distance (feet)	Distance (miles)
1	2700	0.51
2	3000	0.57
3	3500	0.66
4	4100	0.78
5	5000	0.95

Noise:

- owner can hear them
- owner cannot hear them in the house

Shadow Flicker:

- some shadow flicker in kitchen in winter time

Other:

- owner does not receive any compensation from the wind developer

Interview #14 w/ owner October 8, 2016 Deuel County

Turbine	Distance (feet)	Distance (miles)
1	3300	0.63
2	3700	0.70
3	3900	0.74
4	4100	0.78
5	4400	0.83
6	5100	0.97

Noise:

- can hear noise in the house with the windows closed

Shadow Flicker:

- no shadow flicker problems in the yard

Other:

- complained of erosion in the fields next to the access roads
- says red lights flashing at night on the wind turbines are annoying
- owner does not receive any compensation from the wind developer

Interview #15 w/ owner October 8, 2016 Deuel County

Turbine	Distance (feet)	Distance (miles)
1	2700	0.51
2	2700	0.51
3	3300	0.63
4	4200	0.80
5	5100	0.97

Noise:

- used to the noise
- no noise in the house

Shadow Flicker:

- no shadow flicker

Other:

- couldn't get TV reception with antenna anymore after wind turbines were built
- owner does not receive any compensation from the wind developer

Results

Noise:

- 6 out of 15 (40%) of residents interviewed are negatively impacted by the noise generated from the wind turbines (#1, #2, #6, #9, #10 and #12)
- 4 out of 15 (27%) of residents interviewed are mildly affected by the noise generated from the wind turbines (#3, #4, #13 and #14)
- 5 out of 15 (33%) of residents interviewed are not affected by the noise generated from the wind turbines (#5, #7, #8, #11 and #15)

Shadow Flicker:

- 5 out of 15 (33%) of residents interviewed are negatively impacted by the shadow flicker generated from the wind turbines (#1, #2, #9, #10 and #12)
- 3 out of 15 (20%) of residents interviewed are mildly affected by the shadow flicker generated from the wind turbines (#3, #6 and #13)
- 7 out of 15 (47%) of residents interviewed are not affected by the shadow flicker generated from the wind turbines (#4, #5, #7, #8, #11, #14 and #15)

Other:

- 1 resident interviewed reported devaluation of property due to the wind turbines (#10)
- 1 resident interviewed claimed difficulty selling house due to the wind turbines (#9)
- 1 resident interviewed worried about property value (#1)
- 3 residents interviewed reported wildlife has been negatively impacted due to the construction of the wind turbines (#2, #10, and #12)

Conclusion:

Although not scientific, there is nothing unique about the residents that were interviewed. Therefore, the sample of people interviewed is representative of the Toronto – White area wind development. All interviews conducted (both negative and positive) are contained within this report.

There is a wide range of reactions from residents living next to the wind turbines.

There is sufficient evidence from the interviews to demonstrate that a substantial number of Deuel County residents are negatively impacted from noise and shadow flicker generated from wind turbines.

Therefore, the current Deuel County ordinance does not protect a substantial number of residents from noise and shadow flicker generated from wind turbines.

Nebraska wind farm projects cause controversy and heartache

Amy G. Hadachek
for The Fence Post
March 16, 2018


Courtesy photo |

A college instructor on the central Plains said farmers and ranchers are always concerned about conservation of natural resources, sustainability, and...


Courtesy photo |

Tax credits are now being phased out on an 80 percent, 60 percent and 40 percent schedule which will end at the end of 2019. In 2020, wind energy will...

TONY BAKER, NEBRASKA SEN. TOM BREWER'S LEGISLATIVE AIDE SAID THAT HE EXPECTS SOME ACTION ON BREWER'S WIND ENERGY BILS BETWEEN NOW AND APRIL 18. "WE CAN EITHER DO A 'PULL MOTION' OR WE CAN TURN THE BILL INTO AN AMENDMENT AND AMEND IT TO PRIORITY BILL THAT IS VOTED OUT OF

COMMITTEE,“ HE SAID. “THOSE ARE THE TWO CHOICES WE HAVE. WHICH ONE WE USE AND WHEN WE CHOSE TO USE IT IS A QUESTION OF TIMING AND ‘FLOOR STRATEGY’ THAT DEPEND ON WHAT AND WHEN THE SPEAKER PUTS CERTAIN BILLS ON THE DAILY AGENDA AND A MYRIAD OF OTHER VARIABLES. THE ‘POLITICS’ BEHIND HOW WE DO ALL THIS IS MESSY, LAST-MINUTE SORT OF BUSINESS.

I CAN PROMISE YOU THAT ONE OF THESE TECHNIQUES WILL BE USED BEFORE THE END OF THE SESSION.”

Passions are high and opinions are as strong as the prevailing wind in northwest Nebraska, as some neighbors and family members on both sides of the wind energy issue in and near Cherry County, Neb., are verbally clashing over financial, emotional and health concerns related to current and proposed future wind farms.

Recently, Nebraska Sen. Tom Brewer, a Republican who represents legislative district 43, introduced two legislative bills supporting neighbors' concerns about the proximity of living near a number of towering turbines that are in full view of others' rural homesteads.

"Sen. Brewer introduced two bills this year, one is LB 1054 that would give people greater opportunity to express their opinions about a proposed wind energy project. Sen. Brewer's second bill this year, LB 752 repeals a law that currently allows privately developed wind energy projects to use eminent domain," said Tony Baker, legislative aide for Brewer's district representing 13 counties in western Nebraska.

"Wind energy is not a good neighbor," Baker said. "It's a constant 55 decibels of noise that rattles pictures on the wall, and then nobody will ever buy my place, and casts shadows, and causes health effects that have come to light like nausea and vertigo. If your neighbor does something on your ground that's not neighborly, you should have a say. The people who are not participating landowners and not compensated should have some aspect of government listening to them."

Nebraska is unique because while most states have a Public Utilities Commission, Nebraska is the only state in the nation served 100 percent by public power utilities. So, it developed a Power Review Board in the 1960s, to regulate the three utilities in Nebraska; Nebraska Public Power District, Lincoln Electric System and Omaha Public Power District.

"Nebraska laws have evolved over the years, to help the Power Review Board accommodate private electrical generation such as wind or solar. That board was designed to regulate public utilities, not private generators of electric utilities, and it often is not a good fit for renewable energy," Baker said. "So, when you're building a public power facility, you need answers, and there's been no place for the people to express their opinion. Sen. Brewer's bill LB 1054 seeks to restore the public's voice in wind energy projects."

WIND TURBINES

And there are robust voices being heard, and overheard on both sides of the issue. With the enticement of expected high-dollar dividends and federal production tax credits, some residents in Cherry County and nearby communities are struggling with daily life challenges, which they attribute to numerous turbines emerging across the landscape. On the map, Cherry County is visibly the largest county in square miles in Nebraska, and with over 166,000 cows, it's known for having more cows than people; making it a desired rural-by-choice location.

Twyla Gallino was born and raised on the same Cherry County ranch where she lives now, between Valentine and Thedford, and is worried about two proposed wind farms.

"We're in the Sand Hills; this area is sand, and I don't think it would hold a turbine. Our aquifer is only about 30 feet down. That concerns me with their large cement pads, and whether chemicals in those pads could possibly leach out into the aquifer, over time," Gallino said. "Bluestem Energy Solutions is proposing a wind farm that would be about 40-miles away. There's another wind farm being discussed that would be just 20 miles south of my home."

Two hours east of Gallino's ranch, farmers Keith and Vickie May of O'Neill, Neb., were told they wouldn't hear anything above 35 to 39 decibels from the Berkshire Hathaway Energy Renewable's (BHE) 400-megawatt, 200-turbine wind farm in northeast Holt County, that went 'online' November 2016. "We live one mile and one-third from the closest wind turbine, and I'm sensitive to low-frequency sounds, so we purchased a decibel meter. Many nights we have a southeast wind, which is the prevailing wind, it sounds like a jet plane revving but the plane never, of course, takes off," Vickie paused, getting emotional and teary, "So, we pay to stay at a hotel in town."

NOT ANTI-WIND

Interestingly, Vickie's husband Keith who's been on their local planning and zoning board voted for the project. "We were not anti-wind," Vickie said. "The night of the vote of the CUP (conditional use permit), my husband acknowledged he had some concerns. They advised us we wouldn't see wind turbines within four to five miles. What we immediately saw was that our view-shed was changed forever, and we were not prepared for the sound issue on our property."

May said she's heartbroken that the constantly blinking turbine tower lights, in full view now, actively compete with Nebraska's starry night sky. She also reported health-related challenges.

"I can feel a rhythmic feeling in my chest," she said "A representative from the company did come out and apologized, commenting he'd never been on the back side of a project, which sounds different from the front side of a wind turbine. We get 'wake turbulation' when the noise picks up from one turbine to the next turbine. We're not anti-renewable energy, we're just for responsible energy. If the developer would've advised my neighbors, and one neighbor could've taken five less turbines, and another neighbor took three less and been less greedy, I wouldn't have had to suffer. We feel we've been misinformed or that something changed. Some pages for vital information were missing before they were granted permits."

SETBACKS AND REGULATIONS

The Fence Post tried to contact Bluestem Energy Solutions/Omaha, Sand Hills Wind, Invenergy, and BHE, which built the energy farm in Holt County, leaving several messages for owners or managers to respond.

"No comment," said BHE spokeswoman Addison Bratvold.

A representative from a different wind energy company suggested noisy turbines might have a defective blade, and that putting blade tips on the turbines could help. "It's important to work with the community," he said, asking that his name not be used.

We did hear back from a manager with Bluestem Sandhills LLC and Cherry County Wind LLC. Cherry County Wind LLC is comprised of 70 families representing 450,000 acres in Cherry County, developing wind energy on private property.

"Cherry County has some of the strictest setbacks and regulations on wind facilities in the country, allowing for reasonable, limited wind development in our county. The sound from a wind facility is limited to 50dBA," said Michael Knapp, chief of operations for Sandhills Energy LLC., on behalf of Bluestem Sandhills LLC and Cherry County Wind LLC. "That is less loud than the traffic on rural Highway 20, which runs through our county, and not remotely loud enough to 'rattle pictures on the wall.' Also, in Cherry County, while a landowner could build a multi-story grain silo or other building within about 120 feet of a neighbor's house, a wind turbine cannot be within a half-mile of any occupied structure. This is a very strict, and very neighborly setback," Knapp said.

Responding to Gallino's concern about potential chemicals, Knapp said, "There are no special chemicals or structures in wind turbine foundations. The Ogallala Aquifer stretches for some 174,000 square miles. The cement used in a wind turbine foundation is just like the cement used for any other building built on land lying over the aquifer. Extensive environmental review and onsite geotechnical engineering ensure that wind turbines are located far from wetlands and waters of the U.S. on ground suitable for stable construction of the tower."

HEALTH CONCERNS

Regarding health concerns, "The Canadian and Australian governments, and many other governments and several U.S. states, have repeatedly done exhaustive reviews of health impacts, and have repeatedly found no issues," Knapp said.

Also in support of wind energy, a college instructor on the central Plains said farmers and ranchers are always concerned about conservation of natural resources, sustainability, and Mother Nature, and that renewable energies like wind energy and solar energy help promote all three.

"Both wind and sunlight are free sources of energy. Neither create air pollution, unlike other types of electrical generation," said Bruce Graham, Wind Energy Technology Department Chair at Cloud County Community College in Concordia, Kan., who's also a rancher. "I visited several wind farms and found the wind itself is generally noisier than the wind turbines. Improvements in wind turbine design with larger rotor diameters, taller towers and more efficient generation has the price of wind energy selling below fossil fuel generation."

Farmer/rancher Kurt Kocher, who has seven wind turbines in the section where he lives in rural Glasco, Kan., in Cloud County, is located one-quarter of a mile from a turbine.

"Once in awhile, when humidity is high, we hear turbines cutting through the air," he said. "We don't have many neighbors, we have a neighbor one mile east of us and they have a turbine about three-eighths of a mile from their home. We're both being paid to have them by EDP Renewables, as a tenant."

A south wind blows at Kocher's farm about 70 percent of the time. "And that south wind would affect the back side of the turbine. However, 90 percent of the time, we never hear it," Kocher said. "That's just my observation, someone else may be different."

Baker, meanwhile, is adamant Nebraska doesn't need wind power. "Nebraska has a surplus of electrical generation because we have a big nuclear plant and large coal producing plants," Baker said. "The only reason for developers to put up turbines is to make money. The company doesn't own the tax credit, but rather they sell it. The wind energy company comes in and signs a multi-year lease, a non-disclosure clause and makes a few thousand dollars per turbine. When you're in an ag economy and the economy is doing terribly, people are interested."

Nebraska is in a 14-state consortium known as the Southwest Power Pool, seeking renewable energy. "In this 14-state consortium, we're doing something in our state, that's not for our state, but rather for the consortium," Baker said.

Graham said electricity generated by wind farms goes directly to the nearest load.

"The electrons producing electricity are used by the nearest farms, households and businesses," Graham said. The electricity from a wind farm can be sold to a company or utility located in a neighboring state. "Local businesses benefit from wind farms, landowners benefit from lease payments, and local young people can stay in the neighborhood and have very good job opportunities," said the college instructor.

"But, if the federal production tax credit were ever to expire, (cost per kilowatt hour) you'd never see another wind farm," Baker said. "You gotta make payroll, pay salaries, which all go into making a kilowatt hour. There's no way to sell energy made with wind except with the federal production tax credit. These things are tax credit generators."

TAX CREDITS

Regarding the tax credit issue, Knapp said, "For a good look at fossil fuel subsidies versus renewable energy subsidies, head to Cherry County Wind Frequently Asked Questions (FAQ) at http://www.cherrycountywind.com/faq/#subsidies.

"Wind industry tax credits have benefited rural America by growing the economy, creating higher paying jobs, saving electricity consumer's money and supporting the U.S. manufacturing industry. Tax credits are now being phased out on an 80 percent, 60 percent and 40 percent schedule which will end at the end of 2019. In 2020, wind energy will have no tax credits available, unlike all other forms of electrical generation. From all the wind turbine component parts (blades, towers nacelles,) traveling on the Kansas highways it doesn't look like wind energy is going away anytime soon," Graham said.

Baker is also concerned about what he calls a conflict of interest.

"All Cherry County board members have documented conflicts of interest. How can the board be objective and represent all the citizens in the county, when they have an interest and a financial stake in the project? Baker said. If someone is an elected county board member, and think they have a conflict of interest, they have to report it and it would be documented. "Nebraska law currently does not prohibit a county official from voting if they have a documented conflict of interest," Baker said. "The senator's point is preferably a local control issue. But when the local board is part of the project, it's a problem. The perfect answer would be: two miles from a transmission line."

The Cherry County Commission chairwoman disagreed with Baker's comments.

"Mr. Baker's statement is blatantly untrue, as not all of the Cherry County Commissioners have a 'documented conflict of interest and a financial stake in the project,'" said Tanya Storer, Cherry County Commission chair. "All three commissioners, myself included, submitted their information to the Nebraska Accountability and Disclosure Office, as required by law. Only one of the three Commissioners, Mr. VanWinkle, was determined to

have a conflict of interest/financial stake. I am in no way invested in, or involved in Cherry County Wind. I have several family members who are, all of which I reported. I, nor my husband, have ever been a member or invested in any wind project, including Cherry County Wind. All of this information is publicly available through the Accountability and Disclosure Office (http://www.nadc.nebraska.gov).

Storer agreed that the issue has been very controversial in Cherry County, noting, after months of public comment and two public hearings, the first permit for a wind farm was denied in December 2016 due to noncompliance with planning and zoning regulations.

"Due to concerns from Cherry County citzens, the commissioners asked our Planning and Zoning Board to research three specific issues and report back to the commissioners: input from local fire chiefs about fire management related to wind towers; commission an independent appraiser regarding any impact on land valuations on agricultural/grazing; review a recent study completed by the Lancaster Department of Health regarding potential health risks/impacts from wind turbines," Storer said. The completed report can be viewed at: http://www.co.cherry.ne.us/webpages/planning_zoning/planning_zoning.html.

INCREASE SETBACKS

Storer also recommended that planning and zoning increase setbacks (the distance an approved development has to be from a non-participating house, public use area, school, road, etc.) for wind generation facilities, from one-half mile to two miles, which is similar to feedlots. "I don't think the wind industry should be treated more favorably than our own agriculture industry, and I recommended setbacks be structured similarly to our ag industry setbacks," Storer said.

Baker said wind energy is pitting family and friends against each other in northwest Nebraska.

"In the Sandhills of Nebraska, they're the greatest people and would do anything to help you," he said. "But, family members and friends in Cherry County are fighting with each other, because they're in conflict over wind energy projects and making money from it. Wind energy is tearing apart the fabric of Nebraska's rural communities, as it has done in other regional states."

"I have no personal vendetta against them, I'm just merely stating how it's affected us," Vickie May said. "Others may not be as sensitive, but we all feel things differently. Get strong planning and zoning for it."

Baker said people need to remember the importance of being good neighbors, "If you want a check, just don't screw over your neighbors in the process," he said. "This is about giving

people a voice, who are affected by industrial wind energy projects, and making sure neighbors have a voice."

— Hadachek is a freelance writer who lives on a farm with her husband in north central Kansas and is also a meteorologist and storm chaser. She can be reached at: rotatingstorm2004@yahoo.com.

Wind Turbine Meeting Notes……May 28, 2013 Boone County Zoning Meeting

My name is Ted Hartke. I am a professional engineer and professional land surveyor, and I own Hartke Engineering and Surveying, Inc. My dad, Phil, and my brother, Dave, are both farmers. As a land surveyor, I know how emotional and protective people are about their land and the rights they have to get the most out of their property. This wind farm issue is very difficult to deal with, and I have an important story to tell you.

I live in the center of the InvEnergy California Ridge wind farm located in Vermilion County, Illinois, consisting of 138 turbines rated at 1.6 megawatts each and being 495 feet tall.

Before our project started, and throughout its construction, I had no issues with my county's decision to create our existing wind industry ordinance including all of the details within it regarding setbacks or other matters. I did not know or worry about noise pollution. There had been some negativity about noise, so during the summer of 2011, I parked under a wind turbine near Bloomington Illinois on our way to Phillip's church camp. I turned off the car, and myself, my wife, and my kids all got out to walk around and look at things. I could hear light wispy air "whooshing" sounds. I could hear a tractor in a field a mile away and also birds chirping about as loud as the blades' air disturbance. I thought I had very little to worry about the noise from turbines about to be constructed near my home in Vermilion County.

We managed to get through the dust, traffic, construction noise while our road was reconstructed in front of our property. It was exciting to see the huge turbine components hauled past our house. For me, things were friendly between me, the construction crews, and the wind farm representatives. Everything was "just fine." We thought we had lived through the worst part of the project.

In January, our noise problem began. We had a couple bad nights of engine whining noise. We thought we might get used to it….sort of like people become accustomed to living near busy highways or train tracks. However, our noise was lasting all night long, kids were waking up numerous times every night. It was totally unexpected….a complete shock. We were unaware of how the noise was going to change our lives.

I have personal first-hand knowledge of and expert witness testimony as follows:

1.) Wind turbines will wake you up at various times. It is impossible to get healthy sleep.
2.) The engine "whining" or "humming" noise is very disturbing and stressful. This low frequency noise penetrates your house, and there is no place where you can go inside your house to escape it. (OUTSIDE your house, the noise doesn't seem so bad. INSIDE your house, the noise is unbelievable.)
3.) There were mornings when I put clothes on my kids and shoved them out the front door when they were sleep deprived and not ready for a full day of school. Wind turbines are hard on your children.
4.) Our son already had a pre-existing sleep problem and we have been seeing a specialist for ~ 2 years now. Up until the turbines went live, Phillip's symptoms had been improving dramatically and in early January at his last check up with the specialist we had discussed weaning him off his sleep meds. Since the turbines turned on in January, Phillip's symptoms have been gradually returning/becoming worse. Since the developer will not turn the turbines off at night anymore,

we had a very bad noise event at our home on May 11. This was the first time Phillip complained of dizziness from the noise. Later in the evening he started vomiting. It was a really miserable night for the entire family.

The Dr. made some suggestions to help cut down on the noise (special ear plugs) and to cut down on the vibrations caused by low-frequency sound (shock absorbers under the legs of his bed). He also increased the dosage of a medication our son was already taking due to his sleep disorder in the hopes that this would allow Phillip to have greater periods of uninterrupted sleep.

5.) I have argued with my wife at 2:30, 3:30, 4:30, and 5:30 in the morning. Wind turbines are hard on your marriage.
6.) Being exhausted severely impacts your work performance and stresses relationships with employees and co-workers. Wind turbines are hard on your careers.
7.) I have embarrassed myself and have cried in front of my peers while describing the insurmountable problem my family is experiencing with this noise. Wind turbines are hard on your public image.
8.) Standing up and requesting assistance to solve this problem required me to put pressure on my county board representatives. My ties with community leaders have been severed….hurting my small business. Just like any other person, I had to put my family first, and I put my business at great risk while going up against neighbors, public officials, fellow citizens, and construction companies who hire my firm to do engineering and survey work. I decided to come up to your community tonight because I feel a heavy burden and responsibility to other men, women, and children who will suffer from future wind turbine placement.
9.) Between January and May, I was able to convince InvEnergy to shut down turbines approximately 50 times during nighttime noise events. During that time, I contacted contractors and researched ways to soundproof my home. I was rejected by several contractors who did not believe they could fix my problem. Soundproofing against low frequency noise is extremely difficult. My home had too many large windows, a fireplace flue, 5 dormers, vaulted ceilings in the living room and upstairs bedrooms. On Saturday, May 11th, my request to turn off one of these turbines was declined. We were awake all night with high levels of wind turbine noise. We cannot live this way. This wind turbine noise is torture……torture is what you do to terrorists, not my children!
10.) I have researched and studied soundproofing improvements to my home. To get some relief from soundproofing, it will require new windows, doors, exterior sheeting, wall insulation, and roofing insulation. To get the insulation completed will require removal of existing windows, siding, sheeting, and a build-up of roofing materials. The approximate cost to soundproof my home in this manner is $150,000.
11.) My wife and I were very stressed and needed help….we decided that this horrible noise should be documented and reported because of the upcoming discussions for the county board and also to build records to justify our soundproofing repairs with InvEnergy. A Vermilion County Sheriff's Deputy was at my house, in my bedroom, to listen to the noise at 2 AM. Our Mother's Day holiday was ruined.
12.) I emailed the entire county board an open invitation to come to my home, spend time inside my bedroom where I sleep. They have declined to address my problem. Unfortunately, this noise problem will grow and affect more Vermilion County citizens as more turbines are constructed. For

as long as you allow wind turbines to be constructed within 2,500 feet of homes, you will have noise complaints from neighbors. You will become a target of controversy, complaints, political challenges, hatred, and lawsuits.

13.) It is not too late for your community to create an ordinance that protects you from the trouble I am living through.

In conclusion:

I am requesting that, before you vote on this, think about the resident like me who will invite you to stand in their bedroom to listen to the noise. While you are there, he or she will introduce you to their precious children. You will have the opportunity to sit down and discuss with the kids about how it makes them feel. While there are few things worse than a sick or injured child, I believe that hurting them by allowing wind turbines to be constructed too close to their homes is unforgivable.

If you still want to proceed with allowing wind farm development under this weak ordinance, then maybe you should think about how stressed you will be when your names are listed on the lawsuit for voting in support of the inadequate setbacks and no way to enforce noise violations. Now is your opportunity to stop and think about it. If a wind farm chooses not to enter your county based on noise restrictions, then you know that they do not have the capability to fulfill their "good neighbor" promise. Put your noise restriction in writing and include a corrective action to address it such as night-time turbine shutdown upon a legit noise complaint.

Don't be afraid to change your mind. When I have said "no" to my kids, my employees, my clients, and my family, they went through a short period of unhappiness, but I always wanted to do what was fair to everyone involved and still be able to provide for them. You will earn my respect and the respect of wind company representatives…..they may not like it, but they will respect it. It is OK to change your mind in the course of exploring all of the avenues and throughout the presentation of facts. Opening the door to the first wind farm development is like selling the business or the home farm…….you only get one chance at doing it right. Try to learn from other's mistakes and make adjustments accordingly. Learning from your own mistakes is a harder way to go about it.

When you became a board member, I hope it was to serve your community. If you are seated at this table, and your interests are about self-preservation for you and your friends, then you are in the wrong room.

Although my five minute time allowance is up, I would be pleased to give you more detailed feedback and information so that you may make the best possible decisions.

Thank you for allowing me to speak to you tonight. I hope that sharing my experience helps your community.

Sd tax breaks

https://energynews.us/2013/03/08/midwest/is-south-dakota-open-for-business-for-wind-developers/



(Photo by Joel Rivlin via Creative Commons)

Is South Dakota 'open for business' for wind developers?

WRITTEN BY March 8, 2013

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A South Dakota legislative conference committee agreed Thursday on an economic development proposal that could help the state's wind industry catch up to its potential.

Taxes on wind farm construction in South Dakota are currently the highest in the region —up to ten times higher than in Iowa, Minnesota or North Dakota.

The proposal lawmakers agreed to on Thursday would let developers apply to the state's economic development board for up to a full refund of the state's 4 percent sales tax for projects $20 million and larger.

"It's really a historic bill," said Bob Sahr, general counsel for the East River Electric co-op, a member of the South Dakota Wind Energy Association. "They definitely, in South Dakota, have put the 'open for business' sign out for wind developers."

The bill, which was one of two wind tax bills moving through the legislature this week, still needs to pass votes in the full House and Senate, which Sahr said is "extremely likely."

Underdeveloped resource

The flat, gusty Great Plains state leads the nation in the share of electricity it gets from wind power — over 22 percent, according to the American Wind Energy Association's most recent annual report.

But that distinction has more to do with the state's small population and low electricity load. Despite having the fifth best wind resources in the country, South Dakota doesn't crack the top 15 for total installed capacity.

"You don't see the development that would be proportional with its excellent resource," said Joe Sullivan, regional policy manager for Wind on the Wires, a nonprofit that works on wind and transmission issues. (Wind on the Wires is a member of RE-AMP, which also publishes *Midwest Energy News*.)

Several factors are at play, but taxes are a big one. South Dakota is among nine states that have no income tax. Instead, it relies more heavily on other types of taxes, including a 2 percent tax on work that contractors do.

On top of the contractors' tax, South Dakota wind developers also pay a 4 percent tax on equipment. And the operator later pays a gross-receipts tax on power sold by the wind farm.

An analysis by Iberdrola Renewables estimates that a $200 million wind project in South Dakota will pay $11.4 million in upfront taxes, compared to $1 million in North Dakota, $1.2 million in Iowa, or $1.4 million in Minnesota.

"It's an upfront disincentive to build in South Dakota," Sullivan said, even considering the state's superior wind resources. "The turbines are not spinning more often enough to make up the difference."

Wind energy supporters say it is critical for the legislature to act this session before federal tax credits expire and new transmission upgrades are completed.

“We can tell you that if we don’t do something with our current tax structure, it’s very unlikely we would get any more wind energy,” said Ron Rebenitsch, executive director of the South Dakota Wind Energy Association.

Multiple proposals

The bill endorsed by the conference committee, SB 235, will let developers of many projects, including wind farms, apply for significant rebates.

Sahr said a typical $200 million project under the proposal would pay $1 million or less in upfront taxes, making it competitive with neighboring states. The state economic development board would still have discretion on whether to award full or partial rebates.

“The bill could go a long way toward reducing the very high up front taxes South Dakota levies on wind energy projects,” said Adam Sokolski, a business developer for Iberdrola Renewables who prepared its tax analysis. “We support the bill in its current form as passed by the Conference Committee.”

State Sen. Larry Rhoden, a Republican from Union Center, has introduced another bill, SB 195, that would refund much of the upfront wind farm tax but collect much of it back later through production taxes. That bill appears to be sidelined with the advancement of SB 235.

Transmission constraints

Another ongoing challenge is transmission constraints, Sullivan said.

Any significant growth in the state's wind industry is going to be driven by exporting electricity, which requires capacity on long-distance transmission lines between wind farms and larger cities to the south and east.

Several transmission projects are under development in the region, many of them specifically designed to deliver wind power, but South Dakota could miss the opportunity to connect if it doesn't get projects moving into the queue. Capacity is typically awarded on a first-come, first-serve basis.

And exporting will be more costly and complicated because most of the state is not part of a regional transmission organization such as MISO, Sullivan said.

Wind farms on MISO's grid are able to sell power to any customer in the MISO area, which covers much of the Upper Midwest and will soon extend south to Arkansas and Louisiana. In most of South Dakota, though, wind farms can only sell to the local utility, or else pay fees to use MISO's transmission lines in order to connect with other customers.

Sullivan said South Dakota needs to address tax and transmission issues soon while the region's electricity grid is still being expand.

"There's a historic build-out of the transmission infrastructure that's happening," Sullivan said. "If South Dakota misses the opportunity, it'll miss it for a while."